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EDITED BY RICHARD T. ELY, PH.D., LL.D.

Director of the Institute for Research in Land Economics and Public Utilities and Research Professor of Economics, in Northwestern University

MATERIALS FOR THE STUDY OF PUBLIC UTILITY ECONOMICS

INSTITUTE for RESEARCH in
LAND ECONOMICS "UNDER ALL THE LAND" PUBLIC UTILITIES
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MATERIALS FOR THE STUDY OF PUBLIC UTILITY ECONOMICS

BY

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WITHDRAWN

New York
THE MACMILLAN COMPANY
1930

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Set up and electrotyped.
Published January, 1930.

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To

DEAN RALPH E. HEILMAN

who directly and indirectly has contributed
so largely to the development of a public
utility economics

PREFACE

Growth and change in the public service industries continue at a rapid pace. *Public interest* in these essential enterprises was never so great as today, but because of their increasing complexity and the very rapidity with which changes are taking place, public understanding of the utility industries still leaves much to be desired.

Even more important than an understanding by the public at large is an intelligent understanding of the unique character and position of these industries by those actively engaged in their management. There are reasons for believing if the latter is adequately accomplished the former will to a large extent take care of itself.

Forward looking utility companies are increasingly recruiting from among those trained in the *economics* of the industry and are actively assisting in providing such training for those already in their employ. In time the program for public utility education will bring results. To aid in achieving that end the collection and presentation of these materials was undertaken.

The comparatively unsettled state of knowledge about public utilities and the many and wide differences of opinion with respect to the most important features of public utility regulation and management suggested the desirability of presenting, in undigested and controversial form, material covering the *economics* of public service industries. In view of the present disturbed state of the public mind with respect to public utilities such an unopinionated presentation would seem to be particularly appropriate.

Obviously inclusion of material supporting any special position on the many controversial points covered is not to be construed as representing the opinion of the writer or of The Institute which is sponsoring this publication. In so far as possible all sides of important subjects have been given equal opportunity, but this ideal in many instances was far from realized due to the absolute lack or very indifferent character of material representing one point of view or another. A balance was however seriously striven for even to the extent of discarding obviously superior material in favor of variety in point of view.

To Dr. Richard T. Ely, Professor of Economics in Northwestern University and Director of The Institute, I am indebted for personally interesting himself in this project to the extent of securing the funds needed to carry it forward and for his encouragement and guidance which he has always given so freely.

In the tedious task of searching through and preliminarily sifting thousands of references the capable assistance of Mr. Laurence D. Jennings and Mr. Hanina Zinder, of the research staff of The Institute is gratefully acknowledged. For valuable assistance in the arrangement of the material, reading of proof, and preparation of tables of contents and index I am greatly indebted to Miss Grace Leininger.

Herbert B. Dorau

New York
December, 1929

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MATERIALS FOR THE STUDY OF PUBLIC UTILITY ECONOMICS

MATERIALS FOR THE STUDY OF PUBLIC UTILITY ECONOMICS

CHAPTER I

THE DEVELOPMENT OF THE PUBLIC SERVICE INDUSTRIES

1. Economic Development of the Manufactured Gas Industry *

The history of the gas industry divides into four periods. The approximate dates are:

Early Experimental Period (1609-1812)
Period of Early Commercial Undertakings (1812-1850)
Period of Rapid Development and Intense Competition (1850-1900)
Period of Consolidation and Expansion (1900-)

Gas, as a fuel, had its origin in 1609 when Jan Baptista Van Helmont, of Brussels, discovered that fuels yielded up aeriform bodies produced by combustion and fermentation, to which he gave the name ''gas'' (from ''Geist'' meaning ghost or spirit). A few years later natural gas was discovered at several places in England. In 1659, Thomas Shirley investigated a natural gas well in Lancashire, in which he found something which seemed to ''arise from a strong breath, as it were, a wind which ignited on the approach of a lighted candle,'' and ''did burn bright and vigorous.''

It was nearly two hundred years after Van Helmont's discovery of manufactured gas that practical steps were taken to harness the elusive spirit and make it serve a useful purpose. Even as late as 1792, when William Murdock succeeded in lighting his home in Redruth, Cornwall, by distilling coal in an iron retort, progress in developing gas was slow, due mainly to popular superstition. In 1804, Murdock built a gas works and lighted the cotton mill of Phillips and Lee, at Manchester, Eng-

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* Adapted from William G. Maas, *The Economic Development of the Gas Utility*, Chap. I, pp. 1-14, Thesis presented for degree of Master of Business Administration at Northwestern University School of Commerce, Aug. 1, 1926.

land. For this achievement he was awarded the Count Rumford Gold Medal.

Practical application of gas lighting was due to a large extent to the efforts of Frederick Winsor, who appears to have been more of a promoter than a scientific worker or investigator. On May 18, 1804, he obtained the first English patent for gas-making purposes. A public exhibition of lighting with gas was given in the Lyceum Theater in London in that year. In 1812, he was granted a charter by Parliament to organize "The London and Westminster Gas Light and Coke Company," the world's first chartered gas company. Almost immediately the use of gas began to spread throughout the civilized world.

Gas was introduced in the United States in 1806 when David Melville, of Newport, R. I., lighted his house with coal gas. The first commercial gas company in the United States was established in Baltimore in 1816.

Boston was the next city in the United States to establish a plant. A petition was granted to the City Gas Company to lay pipes (1822), but the company failed to make and market gas successfully. Immediately after the failure of this company, a state charter was granted to William Prescott, to organize the Boston Gas Light Company, incorporated subsequently as the Boston Consolidated Gas Company, which is the present operating company in Boston. Its first plant was erected in 1828, and had the distinction for some years of being the largest in the country (15,000 cubic feet holder capacity).

The Boston Company was followed by others in New York (1823), Brooklyn (1835), Bristol, R. I. (1835), and New Orleans (1835). The Washington Gas Light Company, organized in 1848, and its subsidiary, the Georgetown Gas Light Company, had the distinction of being the only companies to be given authority by congressional legislation. The success of the new illuminant immediately led to the proposal to use it for lighting the Capitol and "President's House." It is said that the drippings of the candle-grease on the coat-tails and gowns of guests at official functions in the White House hastened this introduction of gas illumination.

In the early days of the industry in the United States development was retarded by the opposition to establishment of gas plants. A proposition to light the city of Philadelphia with gas was made in 1803, and again in 1817. Both offers were rejected. In 1830, after gas lighting was used in Baltimore, Boston, and New York, Philadelphia still fought against it. "A Public Remonstrance against Light with Gas'' was drawn up by prominent citizens who successfully blocked the innovation in street illumination until 1835, when the city passed an ordinance providing for construction of the works. The plant was completed in 1836. In New England, antagonism toward the industry was very great. Theological, medical, and moral objections were raised. The theological objection was based upon the idea that the divine plan of the world had preordained that it should be dark during the night-time, and consequently artificial illumination would be a worldly interference with this plan. On medical grounds the injurious effect of the emanation of illuminating gas was advanced. Moral objections stated that, on account of the disappearance of the fear of darkness, drunkenness and depravity would increase.

Because of these prejudices managers of the early enterprises found it exceedingly difficult to secure the necessary capital to erect and operate the plants, and it was some time before the industry was established on a commercially sound and profitable basis. In fact, the early history of these companies was a series of economic failures. Rates during these days were necessarily much higher than present day rates. Methods of production were exceedingly expensive, and costs of materials and supplies were very high because of the lack of transportation facilities. In New York City in 1826, the price was as high as $10 per thousand cubic feet of gas. Newer and cheaper methods of production did not appear until about the middle of the nineteenth century, after which time the price of gas began to decline steadily.

During this period gas was used chiefly for street lighting. Later on, public buildings and homes of wealthy citizens were lighted with gas. But not until the decade 1865 to 1875 did the use of gas for home lighting make any real progress.

With improvement in methods of producing gas the early prejudices began to wane and capital found its way into the industry more quickly than previously with the result that companies began to form almost too rapidly. The Chicago Gas Light and Coke Company received its charter in 1849, authorizing the company to manufacture and sell gas to be used for lighting any streets and buildings in Chicago, and to lay mains and pipes for that purpose in any of its streets, lands and highways, provided no permanent damage was done thereby, with no reference to consent by the city authorities therefor.

San Francisco was the first city on the Pacific Coast to use gas for lighting. That was in the year 1854, four years after the city was incorporated. The chief difficulty encountered was the high price of supplies which had to be transported from the Atlantic coast: this entailed high rates. The rate in 1855 was $15 per thousand cubic feet. . . .

The managers of the various utility properties soon came to a realization of the beneficial effects of consolidation in this type of industry, but all early attempts to consolidate the competing properties were usually frustrated by the courts, which held that such consolidations were essentially evil and against public policy. The disastrous and wasteful effects of competition, due to rate wars, the futility of a multiplicity of investments where one would suffice, and the lack of efficient service on account of the attempt to introduce principles of competition in a so-called natural monopoly, were not realized until relatively late in the nineteenth century. Similarly any attempt at consolidation on the part of the utilities aroused the antipathy of the public. Whereas the antagonism that the gas industry had to face in its early days was directed against the *idea* of lighting by gas, now this same public antagonism was directed against the *organization* supplying the service. The public's distrust of large business was reflected in its methods of dealing with the gas utilities, as well as with all other utilities.

All this time, widespread use of gas for home lighting was handicapped by the high rates. In 1846, the price in New York City was $6 per thousand cubic feet; in 1866, it was $3.50 per thousand; in 1888, it was $1.25 per thousand; and in 1900, it was $1.05 per thousand. At the same time, the superiority of gas over whale oil and candles was threatened by the introduction of kerosene and improved oil lamps. In 1870, gas was undoubtedly safer, and with an illuminating value of from fifteen to seventeen candlepower, was a superior illuminant, but was still much higher in price per unit of light than oil lamps, and for this reason could not compete with kerosene.[1] High rates checked even more effectively the use of gas for heating, although it was used for cooking as early as 1859, and there is record of a gas stove in 1851.

This crisis in the growth of the industry was overcome by the independent discovery by Du Motay, a Frenchman, and Lowe, an American, of water gas, the manufacture of which is now known as the Lowe process. Gas could be produced by this process much cheaper than could coal gas under the old method.

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[1] Twelfth Census of the United States, *Census on Manufactures*, X (1900), p. 713.

The first water gas plant was established in Phoenixville, Pa., in 1873. This process was opposed by the coal gas manufacturers until about 1880, at which time they also began to adopt the water gas process, resulting in a great increase in the sales of gas.

With the introduction of electric lighting came more serious competition. Electricity proved to be much more efficient than gas for lighting purposes, and soon began to displace the gas lamps in the homes, and then the street lights. To a certain extent, introduction of the Welsbach mantle saved for the gas industry some of its lighting business which it would otherwise have lost. On the other hand, the *real* development of the gas utility may be said to date from the time when the success of electricity as a lighting medium stimulated the development of a much greater field for the use of gas as a heating medium. Gas stoves and heaters began to appear in homes toward the end of the nineteenth century, but recently the most rapid progress has been in the use of gas as an industrial fuel. The result of this change from lighting to heating use led to still cheaper methods of manufacture. The companies realized the uselessness of maintaining a certain lighting standard in candle-power units, when to maintain only a normal heating standard was much cheaper, since a large amount of enriching material was not needed. But up to 1914, many companies were still required by regulatory commissions to maintain a lighting quality standard of approximately twenty-two candle-power. And this was in spite of the fact that the use of the Welsbach mantle required not illuminating units but heat units. When, after much investigation, commissions in various states changed their requirements, the same volume of gas could be produced at a much lower cost with a consequent lowering of gas rates.

Not long after the introduction of electricity, the coke-oven process of steel manufacture was perfected, by which gas can be obtained very cheaply as a by-product. Such gas is now purchased at low prices by gas manufacturing companies wherever it is available.

The growth of the industry is manifested by the fact that in 1850 there were only 30 companies with a total capitalization of less than $7,000,000.[2] In 1905, the number of companies was 1019, with a capitalization of more than $725,000,000; in 1919, the number totaled 1022, with a capitalization of $1,465,658,265.[3]

[2] Edward B. Lee, "Gas Companies and Their Securities," *Moody's Magazine*, Oct., 1911, p. 289.

[3] *Biennial Census of Manufactures*, 1921.

With the advent of commission regulation, public authority began to realize that most public utility industries would function better as monopolies. Once this principle was recognized, consolidations were numerous and large, resulting in better service and a wider distribution of gas. With the present growth of the holding company, consolidation and other forms of cooperation are being carried out on a large scale. The superpower movement in the electric light and power industry has its counterpart in the gas industry with its high-pressure, interconnection system. The principle involved is the same in both industries—large scale, economical production in centrally situated plants, coupled with wide-spread, low-priced distributions. To what extent this movement can equal the progress made in the electric industry has yet to be shown.

2. A Brief History of the Natural Gas Industry *

There is conflict of opinion as to whether natural gas was first discovered along the Ohio River, within the present limits of the City of Pittsburgh, Pa., or at Fredonia, N. Y. All agree the discovery was made somewhere about 1825.

The first natural gas corporation in the United States was the Fredonia Gas Light and Water Works Company, organized in 1865, when the real domestic use of natural gas began.

In 1867, natural gas was used in several residences in Oil City. The first long distance pipe line in the United States was a two-inch line capable of delivering four million feet of gas, extending five miles from the Newton Well to Titusville, Pa. This line was completed August 1, 1872.

In 1872, natural gas was introduced and was used in East Liverpool, O., by the pottery industry and the year following, Edwin C. Bell discovered that gasoline could be recovered from natural gas by compression.

Gradually natural gas came into general use throughout the State of Ohio and occupied no small part in the upbuilding of our greatest diversified-industry state.

For many years natural gas was shamefully wasted and rates were ridiculously low. In the early days of the industry in Western Pennsylvania, it was so cheap that some towns let it burn all day rather than go to the expense of hiring a man to turn it off in the morning and relight it at night.

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* Excerpt from pamphlet published by A. M. Lamport and Company, New York.

A natural gas ordinance in force in the city of Pittsburgh in 1887 shows prices for cooking ranges $1.00 per month, heating stoves 75 cents per month, and lights 15 cents per month; there was much complaint locally over this high rate since it was sold at one-half this price in surrounding communities. Large country estates were entirely heated with gas for a contract price of $75 per year including use for lighting and cooking if so desired. It was too cheap even to meter.

It took approximately ten years to burn out the Indiana field in what is conceded to be the most recklessly extravagant operation in the industry's history. In 1886, large quantities of natural gas were discovered, and as one writer put it, ''The whole state was ablaze with excitement and burning 'Gas'.'' Free gas was given to manufacturers; uncontrolled wells and leaky lines allowed untold millions of cubic feet of gas to blow into the air. Meters were unthought of. Not until 1907 when the field had almost blown itself away did they think about rates. In the November 25, 1925, issue of *The Natural Gas Industry* are the following interesting facts:

> "In 1907, very close to the exhaustion of the field, listen to some of the rates taken from the files of 135 companies: $2 per month flat rate per stove, $20 to $30 per year per stove, $13.75 for cooking range per year, $5.75 for a heater per year, $1.20 per jet per year, 10 cents to 15 cents per thousand cubic feet. That story is past and the book closed, and the people of Indiana to-day are paying manufactured gas rates for gas; whereas, if the facts had been generally known and understood, and if they had used ordinary means of precaution, which a sensible price for the gas would have been, they could be receiving today the benefits of moderate natural gas rates and a fuel twice the value of any manufactured gas product ever devised for public service."

The industry, owing to its unsurpassed value in the light, heat and power field, is now in the hands of trained experts who, fortified with knowledge obtained through over a half century of operating history, are not only able to conserve the supply but to tell with reasonable accuracy the life of a field and for approximately how many years gas can be taken therefrom. As a result of this, not only have old fields been revived but the life of existing ones greatly extended. When properties have been thus managed, they are among our most prosperous utilities and have experienced no difficulty in early freeing themselves of funded debt and returning to their stockholders large dividends. It is for this reason that a refunding natural gas bond is unknown.

The following are the accepted figures as to value of gas produced for the years indicated:

TABLE 1

1882 .... (approx.)	$ 275,000.00	1922	$221,535,000.00
1900	23,698,674.00	1923	239,960,000.00
1906	46,873,932.00	1924	253,830,000.00
1916	120,227,468.00	1925	264,184,000.00
1921	174,617,000.00	1926	300,000,000.00

The following table shows the amount of natural gas produced each year from 1906 to 1926 inclusive, the value of the gas and the number of consumers as reported by the United States Geological Survey.

TABLE 2

Year	Production in M. Cu. Ft.	Value in Dollars	Number of Consumers
1906	338,842,562	$ 46,873,932	884,018
1907	404,441,254	52,222,399	1,068,186
1908	402,140,730	54,640,374	1,177,973
1909	480,706,174	63,206,941	1,240,697
1910	509,155,309	70,756,158	1,345,989
1911	512,993,021	74,621,534	1,512,224
1912	562,203,452	84,563,957	1,637,493
1913	581,898,239	87,846,677	1,934,071
1914	591,866,733	94,115,524	2,090,985
1915	628,578,842	101,312,381	2,213,439
1916	753,170,000	120,227,468	2,380,772
1917	795,110,000	142,089,334	2,449,895
1918	721,001,000	153,553,560	2,525,124
1919	745,916,000	160,888,000	2,525,849
1920	798,210,000	196,194,000	2,635,968
1921	662,052,000	174,617,000	2,651,904
1922	762,546,000	221,535,000	3,015,000
1923	1,008,135,000	239,966,000	3,234,000
1924	1,141,521,000	253,830,000	3,443,000
1925	1,053,699,000	264,184,000	3,536,000
1926	1,300,000,000	300,000,000	3,750,000 (nearly)

3. Recent Development of the Manufactured Gas Industry *

In the last three years the progress of the manufactured gas industry has been at an even more rapid rate. In 1927 sales aggregated 471,000,000,000 cubic feet. While the demands of the

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* Adapted from pamphlet *The Manufactured Gas Industry* (New York: Harris, Forbes & Company, 1925).

kitchen stove for fuel still constitute a most important part of the average gas company's business, the past ten or fifteen years have witnessed the development of new fields that have added materially to the revenue of the industry and promise even greater things for the future. From the "gas log" of twenty years ago have come the space heaters of today that provide a source of supplementary heating for any part of the house and of which, it is estimated, over 4,400,000 are in use. Central gas-fired house heating systems are now practicable and installations are being made at the rate of about 100,000 a year. This includes installations in northern states as well as in sections like Southern California where the milder climate does not require continuous heating throughout the winter, thus making especially desirable a fuel which can be turned on or shut off at will. The great extent of the domestic field for future expansion is best indicated by the increasing sales of household appliances. During 1924 alone there were sold 450,000 gas water heaters, 500,000 space heaters and 800,000 new gas ranges.

It is in the application of gas as an industrial fuel, however, that the most rapid progress is being made. During the last ten years the consumption of manufactured gas for industrial purposes has increased 1000 per cent and there is every indication that 1925 will again see a new high record established. Clean and convenient; relieving manufacturers of the necessity of tying up capital and valuable space in the storage of fuel reserves, gas is used today for a wide variety of industrial purposes. The gas-fired traveling bread oven is said to make it possible to supply bread to the entire population of the United States with the same number of bakers now required to serve the 2,000,000 people of Paris. It is estimated that over 90 per cent of the work of drying lacquered and lithographed metal ware is now done in gas-fired ovens. These are but a few outstanding examples. Some idea of the extent of the present industrial field may be gained from the figures of an English engineer who has estimated that over 21,000 trade processes are now being carried out with the aid of gas.

Over one hundred years of steady and dependable growth, with sales more than doubled in the last decade, is a record which ought to satisfy the most ambitious industry. But engineers, who have been studying the application of gas to industrial processes and who measure actual achievements in the light of the possibilities their researches have disclosed, take the position that the gas companies have made only the barest start at developing their opportunities in the industrial market. These engineers point out that industrial methods have undergone a fundamental change in the past twenty years. Industrial processes today demand the application to large scale production of the precise and scientific methods of the laboratory. Absolute control has become essential. And the only heating mediums which are susceptible of such control are electricity, fuel oil, and gas. Electricity finds its greatest usefulness as a producer of power. In this field it is preëminent. But as a source of heat it is highly uneconomical. In the generation of electricity less than 15 per cent of the heat content of coal is made available. On the other hand, up to 85 per cent of the heat units in coal are made available by an efficient gas system. When electricity is derived from water power the factors to be considered are, of course, quite different but the use of ''white coal'' as a general heating medium will inevitably be limited to a comparatively few communities peculiarly favorably located with respect to hydro-electric resources. In this connection the following quotation from a bulletin of the Smithsonian Institute is of special interest. ''If the 46,000,000 horsepower of undeveloped water power in the United States were fully developed, and this without regard to whether it was good business to do so, this total hydro-electric energy could heat less than 4 per cent of our homes.''

At the present time, of course, fuel oil is available in large quantities and at reasonable prices, but its use involves many inherent disadvantages as compared with gas. In most cases it must be delivered by vehicles and stored, involving fire risks and some uncertainty as to continuity of supply. Geologists are frequently calling attention to the fact that it is only a matter of time—and, some hold, not such a very long time—before our present sources of low cost oil will be exhausted. It is significant that equipment is now being designed to burn either oil or gas fuel as the user may wish and that executives who are planning far ahead for the gas industry are apt to view the adoption of oil fuel today as an entering wedge for gas in the future.

The American Gas Association has initiated a coöperative program to make gas service available for all industrial processes requiring heat in its most efficient, economical and easily controlled form. A laboratory has been established by the Association at which extensive tests are being carried out for the purpose of standardizing and improving all kinds of gas-fired appliances. More recently a national research organization has

4. Statistics: Manufactured Gas Industry *

TABLE 3

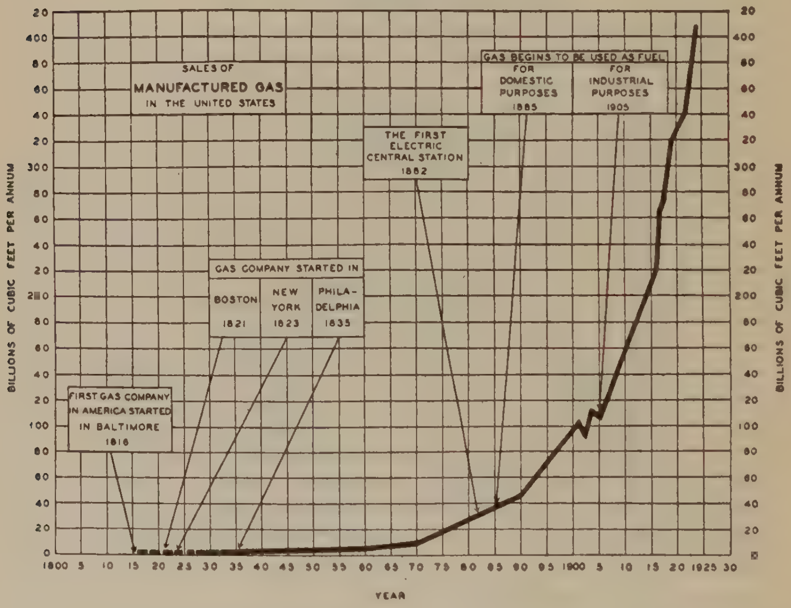
	1923 [a]	1921 [a]	1919	1914	1909	1904
Number of Companies.....	939	954	1,022	1,284	1,296	1,019
Gas Production (M.C.F.)..	386,547,471	333,997,626	344,119,811	203,639,260	150,835,793	112,549,979
Value of Product [b]........	450,097,161	411,195,503	329,278,908	220,237,790	166,814,371	125,144,945
Expense [c]	286,261,831 [d]	281,689,573 [d]	258,834,258	135,050,701	113,500,978	92,258,955
Total Capitalization	[e]	[e]	1,465,656,265	1,252,421,584	915,536,421	725,035,204
Number of Employees [f]....	66,164	53,657	63,328	63,993	51,007	40,034
Salaries and Wages.......	95,103,934	79,265,435	77,931,081	44,330,684	33,316,068	25,521,616

[a] Does not include plants with product valued at less than $5,000.
[b] Selling Price at point of manufacture.
[c] Includes Wages and Salaries, Materials, Rentals, Taxes, and Contract work.
[d] Does not include rentals and taxes.
[e] Figures not available.
[f] Includes proprietors and firm members.

* *Census of Manufactures 1923.* (United States Department of Commerce, Bureau of Census, Washington: Government Printing Office, 1925.) Supplemented by Census for years indicated.

been proposed, to be underwritten by the gas companies of the country, which would develop efficient gas-burning equipment for all industrial heating purposes. The aim is admittedly to make gas the universal fuel. The future predicted for the utilization of gas in industry by those who are in closest touch with these developments—hard-headed, practical men whose business it is to deal concretely with concrete facts—cannot be fully set forth in such limited space. It can be briefly and conservatively summed up, however, by citing the action of the American Gas Association, which, under the slogan "If it's done with heat, you can do it better with gas," has set for the industry the goal of a 50 per cent increase in sales in three years.

Chart 1



5. Chronology of the Development of the Gas Industry *

1609—Van Helmont discovers "gas."
1659—Thomas Shirley discovers natural gas well.

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* Selected from chronology, in O. E. Norman's *The Romance of the Gas Industry* (Chicago: McClurg and Company, 1922), Appendix A, pp. 159-172.

1792—William Murdock lights his home with gas.
1803—Main Street, Richmond, Virginia, lighted by a huge gas lamp.
1804—Frederick Winsor demonstrates gas lighting at the Lyceum Theatre, London.
1812—Royal charter granted to the London and Westminster Gas Company.
1812—David Melville of Newport, Rhode Island, lights his home with gas.
1816—First gas company in the United States incorporated in Baltimore.
1823—Boston Gas Light Company established.
1825—New York Gas Light Company established.
1844—Improved dry meter patented.
1851—Davis cooking stove used in the United States.
1873—Lowe invents carburetted water gas process.
1885—Welsbach mantle invented.
1885—Instantaneous automatic gas heater invented.
1911—188,855,400 cubic feet of gas sold for gas engines in Philadelphia.
1920—Several industrial plants in Chicago, each use 15,000,000 cubic feet of gas a month.

6. The Growth of the Electric Power and Light Industry in the United States *

No other industry can show a growth so rapid and at the same time so big and so consistent. From a comparatively minor factor in the business world twenty-five years ago, the electric power and light industry is now a giant among the country's business giants. The beginning of the industry dates only from 1882 and its greatest progress has been made during the last twenty years, while in the last ten years alone there has been greater expansion than in all the previous years of the industry's existence.

In 1902, according to the United States Census, the industry had an investment of only $628,000,000 as contrasted with $4,500,000,000 in 1922 and with its present investment of approximately $9,500,000,000. The gross earnings of the electric power and light companies in 1902 aggregated approximately $86,000,000 as contrasted with gross earnings of approximately

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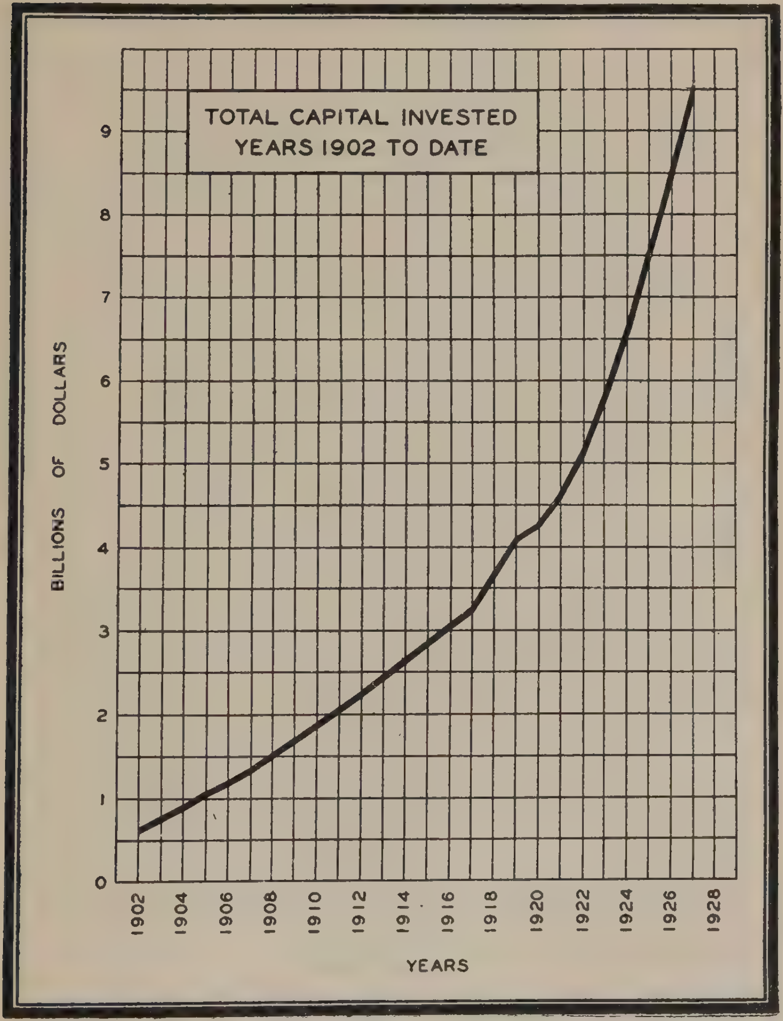
* Adapted from pamphlet of same title by Edward B. Lee, Statistician of the Electric Bond and Share Company (New York, 1925); with figures brought up-to-date as of January 1, 1928, from the *Electrical World*.

$1,800,000,000. In 1902, the output of the electric generating stations was about 2,508,000,000 kilowatt-hours, as compared with 47,000,000,000 kilowatt-hours in 1922 and with a present annual output of somewhere between 70,000,000,000 and 80,000,000,000 kilowatt-hours. These figures show that during the last two decades the industry every five years has practically doubled its earnings and output.

Twenty years ago there were not many electric generating stations of average size having generating units of more than 5,000 kilowatts capacity each. Ten years ago generating units of 10,000 kilowatts capacity were being installed in the larger and newer stations. Five years ago so much progress had been made and the business had so increased in volume that units of 15,000 kilowatts generating capacity were being very generally installed. Today units of 20,000 kilowatts, 30,000 and 40,000 kilowatts capacity are being installed in the largest stations, while in a few of the country's biggest stations there are units having a capacity of 50,000 and 60,000 kilowatts each and one unit to have a capacity of 200,000 kilowatts is now under way. And each of these higher rated units was measurably more efficient than its predecessor.

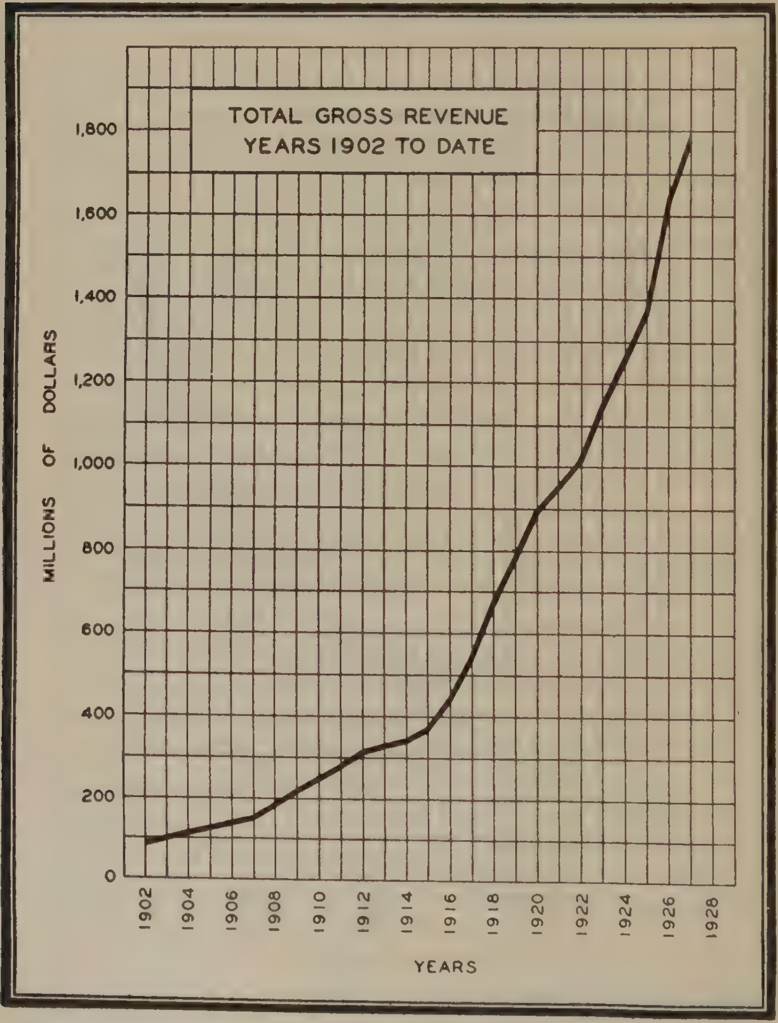
The generating units of greater size would not have come into existence and the big increases in output would not have come about if it had not been for the invention and adoption of methods whereby electrical energy could be transmitted over long distances from the points of generation to the points of utilization, no matter where located. The first successful transmission line was a little less than 29 miles in length and was placed in operation in 1892. It was designed to operate at only 10,000 volts. From that small beginning the length of transmission lines and the voltage have been gradually increased until now lines 100 miles in length are very common and lines 150 miles in length are numerous. The voltage also has been increased until now, outside the biggest cities, energy is generally transmitted at 33,000 volts or over, while there are many lines operated at 132,000 volts and there is one line in successful operation transmitting energy at 220,000 volts and other lines of equal capacity are under construction. There are now many thousands of miles of high voltage transmission lines in the United States, many of them tied together in extensive systems covering entire states, while the energy sent over the lines of any one system is usually generated from only two or three great primary plants having generating capacities beyond anything dreamed of a quarter of a century ago.

Chart 2



In many parts of the country there are transmission systems that have been connected to such an extent that they extend over several states. One such system in the Middle West now extends through portions of the states of Virginia, Kentucky, West Virginia, and Pennsylvania, over a part of Ohio and into northern Indiana and southern Michigan. Another large interconnected system extends from Tennessee through Alabama, Georgia, North Carolina, and South Carolina. One of the largest interconnected transmission systems covers practically the entire state of California. Such great systems are in no one case the

Chart 3



property of one company, nor even of companies having financial relationship, but of several companies entirely financially independent, whose properties have been tied together so as to obtain the most efficient operation with a corresponding improvement in service to the public. Such physical interconnections also materially reduce investments in plants, as the individual companies are not obliged to maintain so great a reserve capacity.

Another reason for the growth of the transmission systems has been the corporate merging of many operating companies, resulting in the creation of greater electric power and light companies whose earnings run into the millions of dollars and whose activities cover in many cases thousands of square miles. The creation of these larger companies has made possible the issuance and sale of substantial amounts of securities put out under modern capital structures and financing conditions and giving assurance of entire safety to the purchasers. Thus the corporate merging of companies and the tying together of the properties physically has meant not only more extensive and improved service to communities, large and small, and industries, big and little, but the sale of more and safer securities to a rapidly increasing investing public.

The financial growth of the industry is seen both in the great increase in gross earnings, which naturally would come from the tremendous expansion in business, and in the development of a sounder financial structure. In 1902, as before stated, the gross earnings of all the electric power and light companies in the country aggregated approximately $86,000,000, whereas the annual gross earnings are now approximately $1,800,000,000. To keep pace with the demand created by the development and extension of industry and service, resulting in the enormous growth in earnings, it was necessary, of course, to increase in much the same measure the capitalization of the companies. In 1902 the total capitalization was only $628,000,000, as contrasted with a present figure of approximately $9,500,000,000.

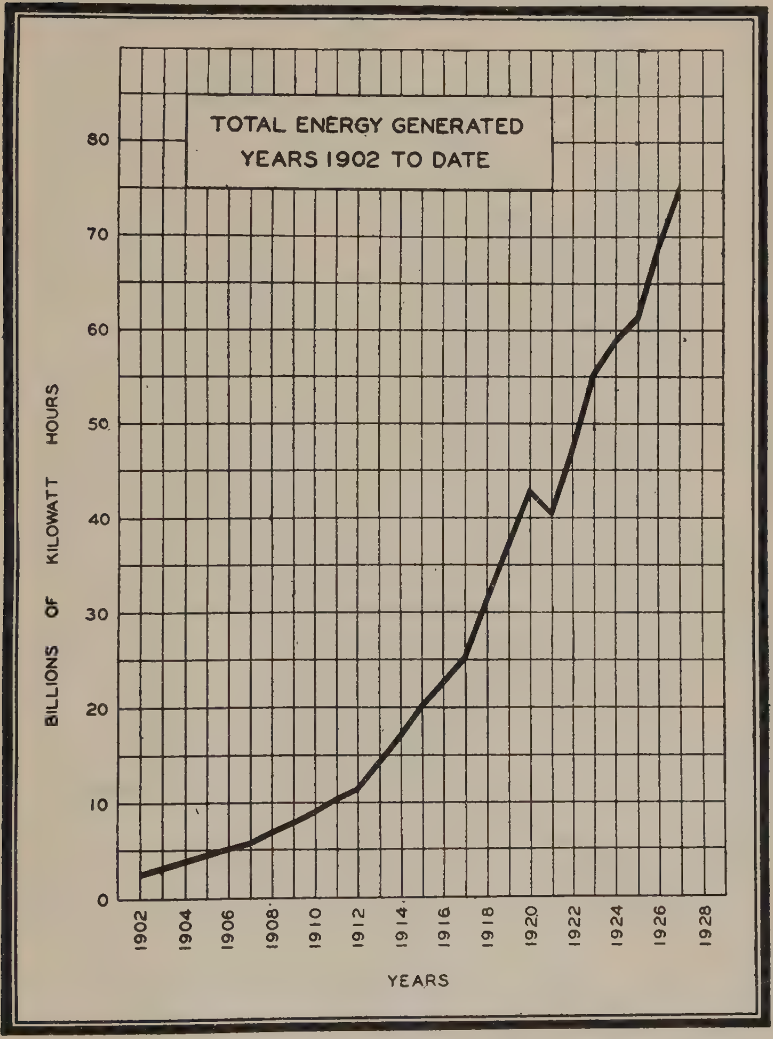
These tremendous increases in earnings and in the accompanying capitalization would not have come about if it had not been for the radical changes in the character of the industry. The electric industry started, and continued for a number of years, as strictly a lighting business, and it was not until the beginning of the present century that the industry adapted itself to any extent to the industrial end of the business. From the time that the companies began, in a very small way, the sale of energy for industrial purposes, however, the growth in this direction has been startling. Industry after industry has been electrified, due to the ability of the engineering profession to make practical application of the use of electrical energy to specific industries. The result is that the successful electric power and light company today has an industrial load by which it disposes of anywhere from 25 per cent to 50 per cent of the entire energy generated.

The financing of most modern electric power and light companies now involves the sale of preferred stock to the consumers of the operating companies. Up to ten years ago practically all preferred stock was sold by the issuing companies to dealers who in turn distributed the stock to the public in the same manner as the bonds of the companies. The customer-ownership plan was started on a small scale by one important company and met with such success that other companies gradually adopted it until, within the last two or three years, it has become a nation-wide movement. So successful has the customer-ownership financing been that many of the leading companies have been able during the last year or two years to sell in these campaigns, rather than through dealers, all the preferred stock they have issued.

There is no immediate financial benefit to the companies in disposing of their preferred stocks in this way, as the cost of carrying on the customer-ownership campaigns is as great as the amount of commissions paid to dealers for disposing of the stock. The great benefit comes to the companies in having as partners those with whom they do business. No other factor has ever come into the industry that has been as helpful in improving the relations between the companies and the consumers they serve and the government officials under whose jurisdiction they operate than the customer-ownership movement.

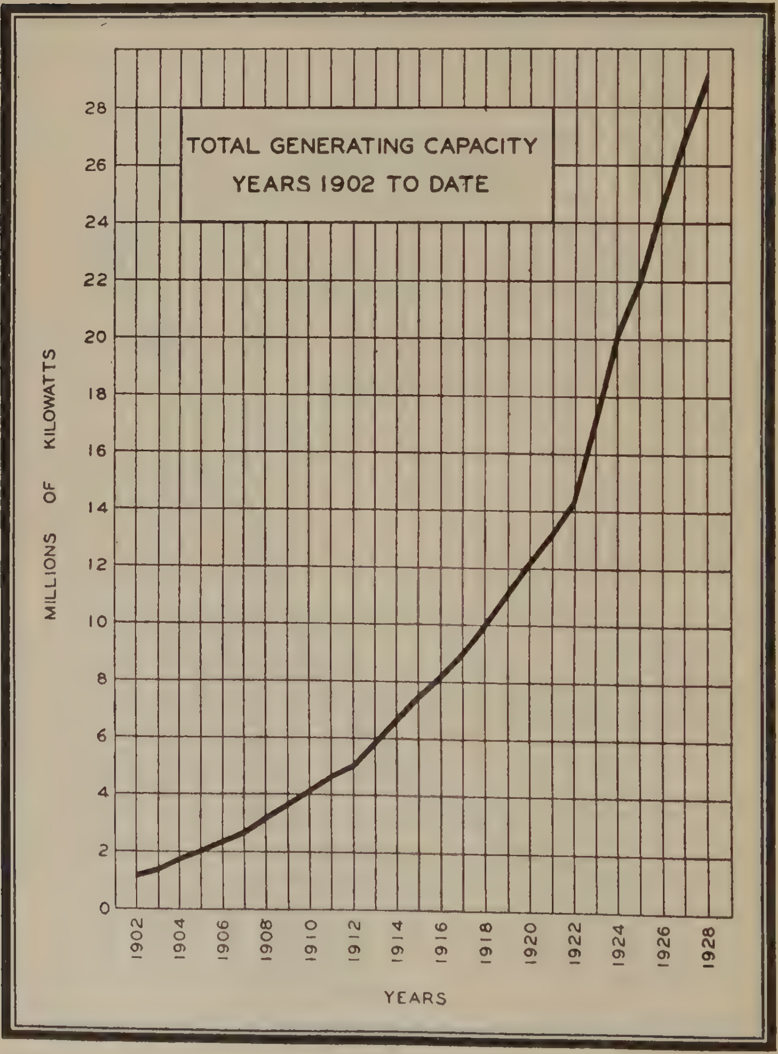
The putting together of several operating companies into one big operating company has gone a step further by the creation of one big company to control groups of operating companies. The big company is usually referred to as a holding company, which it is, although it has as well the function of an investing company and a supervising company and, more important still, the function of a developing company. The holding company so-called is not, of course, a new factor in corporate finance. In the utility industry it has, however, taken on new features and assumed greater prominence during the last two decades. A holding company frequently owns securities of companies operating in the same community, although the newer form of holding company usually has, for its subsidiaries, companies operating in many communities in various parts of the country. This gives the securities of the holding company the important investment element of geographical diversification.

Chart 4



These holding or investment or supervising or developing companies have come to their present important status due to the rapid growth of the industry and to the need of expert knowledge along many lines for the operation of any electric power and light company. One of the many important functions of the

Chart 5



holding company is to see that the ever-necessary flow of capital for property additions is never stopped. Another function is to provide the operating company the experienced talent necessary along construction, engineering, operating, legal, financing, and many other lines. By reason of its interest in many companies, the holding company can afford to have on its staff the most experienced men in all lines and the services of these men are available at all times for the companies associated with the holding company.

From what has been written it might be assumed that the electric power and light industry is now at its peak. This, however, is far from true. Despite the tremendous progress during the last quarter of a century with the industry practically doubling its activities every five years, there is an ever continuing need for substantial additional generating capacity to supply present demands; and the history of the industry shows that as soon as present demands are satisfied, new additional demands come into existence.

The United States every day becomes a greater industrial workshop. Even if all industrial plants now in existence had been electrified, the electric power and light industry would continue to grow by reason of the increase in the number of industrial plants and the enlargement of those already operated. As a matter of fact, despite the present quite general application of electrical energy to manufacturing use, probably not more than 60 per cent of the industrial power now being used in this country is electric power. Even with a continuance of the rapid growth in the application of electrical energy to industry, many years will elapse before all of the present existing industrial plants will be electrified.

This is true also of the use of electricity in the home. Strange as it may seem, it is estimated that less than 43 per cent of the population of the United States live in electrically lighted dwellings. And, of course, the number of residences largely increases each year. With the spread in the use of domestic electrical appliances, the demands on the electric companies from this source grow substantially each year.

Still another source of future revenue to the industry is through farm electrification. This can, of course, come about only gradually, due to the initial heavy cost of building lines to serve isolated consumers. However, this field is gradually being entered and electric service is being extended to many outlying districts. Down to the present time, however, it is estimated that only 12 per cent of the farms in the country have electric service.

It has been estimated that there are now within reach of the lines of the electric power and light companies approximately 20,500,000 potential electric consumers, of whom only about 12,500,000 have been developed, leaving approximately 8,000,000 prospective consumers.

The tendency of the growth will continue to be toward concentration into large units, as it is through such concentration that the greatest efficiency in operation, with a resulting maximum service at lowest cost, is obtained. It is reasonable to believe that ten years hence, in looking back over the record of the decade, the same startling increase will be apparent as those that are now shown for the last ten years.

7. Prospects of the Electric Light in 1881 *

You ask me about Electric Light. Well, I have seen 700 lights burning, the current generated from the same dynamo-electric machine for the whole lot, all of them getting their current from the same mains (i.e., street cables) of no less than eight miles in length. Edison gets eight lights or thereabouts of 16 candles each per indicated horsepower, which allows of his competing with gas. Into the details of the cost I cannot go; in New York he can produce light and get a handsome profit on it at a charge to the consumer which would ruin the gas companies. There is not, however, that vast difference between the cost of the two lights which will allow him to be utterly oblivious of his friends, the gas producers; but his estimates show that he can compete with them and do it at a handsome profit. Besides he can furnish power by means of electric motors, which will give him an enormous pull over the gas companies as he will not have the greater part of his plant lying idle during 365 working days of the year, as the gas companies with but very slight exception must, as the business is at night; but he can sell electricity for power purposes by day, which means that his plant is never idle, his capital is never running to waste, but is always earning money by night and by day alike. Edison will work just as the gas companies do. He will have central stations where the current will be generated (probably one station of about 15,000 lights to each square mile).

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* Personal letter written May 1, 1881, by Samuel Insull while private secretary to Thomas Edison, quoted in *Central Station Electric Service* (privately published, Chicago, 1915), pp. xxxvii-xxxix.

This current will be conveyed along the street underground by means of copper wire embedded in two-inch iron pipes insulated with a special form of insulation of his own invention. Branch pipes will be led into each house, and the electricity, whether for light or power (to us it is all the same), will be sold by means of a registration on an electric meter, which is the most ingenious and yet the simplest thing imaginable. The district which he will light up first in New York has about 15,650 lights in the various buildings in the district and a great deal of power varying in amounts. He is getting contracts just as fast as his canvassers apply for them, and we have large gangs of men wiring the houses in anticipation of the time when we can lay our mains, erect our dynamo machinery, and light up. I suppose this district will be all lighted up in from three to four months, and then you (will) see what you will see. You will witness the amazing sight of those English scientists eating that unpalatable crow of which Johnson used to speak in his letters to me when I was in the old country.

Menlo Park is practically abandoned. All experiments are finished; all speculation on the probable results are dismissed; and Edison thinks, and so does everyone else who has looked into the matter, that success is assured. Of course time alone can prove this. As for myself, I am not competent to judge but I can use my eyes, can see the success with which the houses, fields, roads, and Depot have been illuminated here, and I can see nothing to disprove the assertions. His lamps last about 400 hours; at all events that is the estimate by a time test, i.e., by running them at about four times their ordinary candle-power until the carbons break; but this estimate is every day falsified, and experience points to the conclusion that the life of his lamps will be *much longer* than the estimate. As for rivals, Edison has but little fear, in fact, none from them. I have seen how Maxim's lamps go, and his utter want of a system by means of which alone can success be attained, and Swan we put in about the same category, but as he is a fellow countryman of mine, I will spare you the plain language used towards him.

To carry out the gigantic undertaking of fighting the gas companies we have much to do. A great difficulty is to get our machinery manufactured. This Mr. Edison will attend to himself. He personally has taken very large works for this purpose, where he will probably within the next six months have 1500 men at work. The various parts of the machines will be contracted out, one firm making one part in large quantities, another firm another part and so on. At Mr. Edison's works ("Edison Machine Works") all these parts will be assembled and put together. Then there is the lamp factory, in which Mr. Edison owns almost all the interest, for manufacturing lamps and which is now turning out one thousand lamps a day, the Electric Tube Company (of which I am secretary and Mr. E. president) for manufacturing our street mains. So you can imagine what Mr. Edison has to do, as he is the mainspring and ruling spirit of everything. And you can imagine also what I have to do as his private secretary. We work every night till the small hours, and today (Sunday) is the first Sunday I have not been at the office; and even here we are at work as between the intervals of writing this letter I am taking notes of a lot of data he wants before I go to bed tonight.

8. The Central Station *

The year 1882 marks the constructed conception of the first Edison stations—the first to fulfill our present conception of a *central* station, that is, a source of electric supply, divisible for sale to each and all for every use. The standard of that station was not maintained in some few succeeding years, but its salient features originated and still constitute the most primary and vital features of Central Station practice to this date, which is an extraordinary tribute to the inventor, the more so when one realizes the state of the prior art.

For the preceding eighty years a series of apparently unrelated electrical discoveries had been an aimless progress with no commercial impetus. Steam as a motive power had become available through the invention of the steam engine by Watt in 1769. Dynamic electricity, as generated by chemical batteries, was discovered in 1800. The dynamo originated in 1831 with the discovery of electro-magnetic rotation by Faraday. He demonstrated it by the spinning of a little copper disc between the poles of a permanent magnet. The armature was first wire-wound and the first commutator built in 1832 by Pixii. The field was first energized by a wire-wound electro-magnet in 1845. The dynamo field was first made of the multi-polar type and the fields first compounded in 1881. The arc light was first produced in 1802 by Davy and it was first publicly exhibited by him in 1810, chemical batteries furnishing the necessary current. These lights attained little commercial importance until 1876, when Charles F. Brush completed his "system" of dynamo, arc lamps, regulator, and accessories. The Thomson-Houston "system" was completed likewise soon afterward. The electric motor was built first in 1833, antedating the dynamo, and a motor built in 1838 propelled a small boat. Various motors were built in the following years, but not in a large, commercial way until the introduction of the Sprague motor in 1884. The incandescent lamp of high resistance type, the basis of modern illumination, was invented in 1879. A miniature electric railway carried passengers at an Exposition in 1879. The first storage battery, then called a "box of electricity," was built in 1881. No units of electrical measurement were authoritatively defined until the Paris Electrical Congress of 1881 adopted the ampere, the ohm and the volt. These various advances then had no commercial importance. All the devices were built of small size and were not suitable for commercial use. The familiar construction materials of today were not available; the inventor had even to insulate his own wire.

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* Excerpt from Martin and Coles, *The Story of Electricity* (New York: The Story of Electricity Company, 1919), Vol. I, Chap. IV, pp. 73-78.

The Centennial Exposition at Philadelphia in 1876 marked the birth of commercial activity in electrical enterprises. No such activity had existed previously except in the telegraph.

The arc light was, after the telephone, the next electrical application to secure a commercial start. More illumination in public streets than gas afforded was needed; arc lights became the new fad, and hundreds of street lighting plants were built, supplying cities and towns everywhere. The movement had its greatest force from 1880 to 1893, or up to the time of the Chicago Exposition.

The development was accomplished by "systems;" that is, each inventor, dozens of them, invented his particular dynamo, arc lamps, regulators, and accessories, known as a "system," each exploited by its particular manufacturing company, and all competing intensively with each other. Each local company was organized to secure, or organized on the basis of having secured, one contract; that is, the municipal street lighting contract of its own city. The contracts were for street lights of "2000" or "1200" candle power, later qualified as "nominal," and otherwise much of the form still prevailing; that is, for periods of one to ten years, for hours of the night from at or near sunset to at or near sunrise, or to 11 P.M., or to 12 P.M., or excepting moonlight hours, variously called all-night, half-night, and moonlight schedules, each with various qualifications. These companies owned, operated, maintained, and trimmed these arc lamps, mostly located in the streets, a few in stores and public buildings, and sold light as distinguished from electricity. These companies formed the nucleus, however, from which in later years was developed the central station industry.

The hours of lighting fixed the hours of station operation, varying from 1500 to 4500 hours per year; hence, they fixed many expenses. The idle, non-revenue daylight hours of the many arc-street-lighting investments were an acute handicap to a great body of ambitious men who wanted to broaden the service; and this handicap operated later, more forcibly than any other visible conditions, to stimulate and coördinate electrical undertakings and to crystallize them into the modern central station.

Edison was finishing his brilliant inventions in the telegraph field when the arc lighting systems were being exploited, and turned his attention to incandescent lighting, power, railway, and other applications of electricity. He was active in various directions, building a dynamo in 1878, but his crowning invention on October 21, 1879, was the high-resistance, incandescent lamp, the first incandescent lamp built for parallel operation. This was called "dividing" electricity, in the phrase of that day, and created the greatest public interest and excitement. The system was condemned by many leading scientists, otherwise very competent men. This "dividing" of electricity made a permanent impression on the public mind. Today it is the standard of distribution the world over. As the champion of the divided supply of electricity, with his small incandescent lamps, Edison proceeded with the greatest courage to put his conceptions into concrete expression.

Two Edison stations were started in 1881-2. One in New York City, operated by steam; the other, in Appleton, Wis., operated by water power. The station designer of today who has to select an appropriate collection of apparatus to be contained in a suitable building, does not realize what designing meant in those days. With little or no precedent for a guide Edison had to conceive the necessities, invent, design, and build not only the dynamos, but the station rheostats, switches, ammeters, voltmeters, regulators, fuses, and all the numerous other things required within the plant. Nor did his labors stop there, for he had also to create all the various devices required in the distribution system, including fuses, switches, sockets, and the like. And the miracle is that he made a complete workable system.

The New York Station of 1882 operated in "parallel" at 110 volts direct current, the engines were directly connected to dynamos, the boilers were water-tube type, Babcock & Wilcox make, and the distribution system was underground. Strange, is it not, that this first American central station initiated some of the best practice of today, thirty-seven years later, when over 5000 central stations are operating in the United States.

The Edison system was installed in some scores of cities during the next few years. All these early Edison plants operated incandescent lamps almost exclusively. The current could be measured by meters of an electrolytic type, but not many plants used them. The meter plates were weighed and the deposit of metal was expressed in "lamp-hours." One cent a lamp hour was considered a very fair charge, equivalent to about 14 cents per kilowatt-hour (our familiar friend, the kilowatt-hour, was not christened or legal until 1893-4). Most lamps were charged for at a monthly rate. In form, then, the early Edison stations sold *illumination,* and not current. Arc lamps were rare on these circuits.

The Sprague motor for Edison circuits was first produced commercially in 1884. The introduction of these motors was the first distinct broadening of the Edison commercial field. The service was suitable for a great variety of uses, and in a way, although a minor one, was beginning to determine a wider usage.

The commercial situation had developed to this point in 1886. The arc light companies located in every city could extend their circuits for some miles and reach every part of the city, but only could sell arc illumination and were hungry for a wider field of service. The Edison Companies located in few cities only, could supply in principle every need with the 220-volt direct current service, but could deliver current only a short distance, a very few thousand feet from the station.

The foregoing situation was revolutionized by the next development. The first alternating current system with transformers and parallel distribution built in this country was constructed in 1885 at Great Barrington, Mass., by William Stanley. The Westinghouse Company had initiated the development in this country. The arc light companies quickly recognized the opportunity to add indoor incandescent lighting to their service, and within a few years hundreds of high-voltage alternators were set up alongside the older arc dynamos, primary wires erected alongside the arc circuits, and alternating current distributed for incandescent lighting without those limitations of distance that were so restricting to the Edison companies. The arc companies had now made the definite start toward furnishing a complete central station service. The allied modern hydro-electric development was started in 1890 by building a long distance line in the West to transmit alternating current from a water-power station. All these earlier alternating systems were of high frequency; that is, 125 or 133 cycles per second. Integrating watt meters to measure the sales of alternating current became available with the inventions around 1888 of Shallenberger and Thomson. One more great invention was necessary to start the unification of these various electric systems and to promote the universality of electric supply.

Nikola Tesla had been annoyed in some early work by the sparking of a dynamo commutator and his study of such phenomena was to be rewarded by one of the greatest inventions. The fruition came in 1888 with his polyphase apparatus giving us the commutatorless alternating current motor with better means of extending the limits of transmission and of correlating the work of alternating and direct currents without restricting the usefulness of either. The invention of Tesla marked a great step onward, but was not fully appreciated in the midst of other activities of that date or of this. Thereafter hydro-electric developments had a new and incalculable value.

Central station progress can hardly be understood without some knowledge of concurrent commercial conditions. In the earlier years there had been great rivalry among the arc systems, and these then had little in common with the Edison system. The electric railways had nothing in common with either. The telephone companies sought to prevent the introduction of electric railway systems with grounded circuits, as these nearly ruined the telephone service which then operated also with grounded circuits. The Edison interests opposed the introduction of high voltage alternating systems then insulated with some uncertainty, and sought patent control of incandescent lighting. But this manufacturing rivalry and patent litigation had to yield to the compelling force of central station progress. The Thomson-Houston Electric Company, then having acquired control of most American arc systems and prominent in electric railway installation, and the Edison General Electric Company, always the great champion of low voltage direct current supply, consolidated in 1892 to form the present General Electric Company. The latter in turn agreed with the Westinghouse Company at that time, as now, a distinctive leader in alternating work, to pool patent rights, and thus the field was cleared for the next stage of central station growth.

The unification of electric supply, that is, supplying from one station and one type of generator electricity for each and every purpose, had become possible with the preceding inventions; manufacturing and patent interests had been harmonized to an important degree, professional relations were more friendly, and the ten years from 1893 to 1903, while partly years of business depression, were marked principally as the active years of developing central station inventions and methods, and absorbing them into general practice.

No great inventions in electric motors, other than those of Tesla, had occurred since the central station industry started, but the advances in engineering design, the decreased cost, the application to new uses, the constantly growing appreciation of their convenience and economy, all pushed by aggressive managements of the local companies, had caused stationary motor consumption of current to increase at a higher rate than that of lighting current.

The growth of central station output due to the cumulative effect of more and more lighting, motor service and other uses, combined with larger areas of supply, had reached such a point by 1903, that the more important local companies could not get engines large enough to keep the generating units in a station within the limits preferred for the best economic results. At that time steam turbines of a few hundred kilowatt capacity had been developed to drive electric generators, and a few had been installed in central stations. It was not then realized what a part the steam turbine would soon play in the larger central station practice. At last one courageous captain of industry insisted on a five-thousand-kilowatt unit and the rest of the story is short. The first all-turbine central station was built in 1903 in Chicago with 5000 kilowatt units. Today 35,000 kilowatt units are available, and I suppose larger ones could be built if needed. Mechanical and electrical limitations on the size of central stations are now remote so far as any present or prospective need is evident. Likewise boilers are larger, steam pressures are higher, vacuums are better, steam is superheated, and many other improvements have been made. Not only has the steam turbine removed restrictions of size for central stations, but it has reduced the steam consumption per kilowatt-hour about one-half. Realize what this means as the furthest present reach in the expansion of the industry.

9. Central Electric Light and Power Establishments *

TABLE 4

	1922	1917	1912	1907	1902
Number of Establishments [a]	6,355	6,542	5,221	4,714	3,620
K.W.H. Generated	40,291,536,435	25,438,303,272	11,569,109,885	5,862,276,737	2,507,051,115
K.W. Capacity	14,313,438	8,994,407	5,165,439	2,709,225	1,212,238
Total Income [b]	$1,072,119,883	$ 526,894,240	$ 302,273,398	$ 175,642,338	$ 85,700,605
Total Expense	$ 859,625,091	$ 426,568,307	$ 234,577,277	$ 134,196,911	$ 68,081,375 [c]
Value of Plant and Equipment	$4,465,015,691	$3,060,392,141	$2,175,678,266	$1,096,913,622	$504,740,352
Total Capitalization	$4,374,062,072	$2,857,571,124	$2,052,494,697	$1,341,995,182	$627,515,875
Number of Employees	150,762	105,541	79,335	47,632	30,326
Salaries and Wages	$ 212,432,655	$ 95,241,858	$ 61,161,941	$ 35,420,324	$ [d]

[a] On basis of ownership.

[b] Does not include revenue from sale of current by Electric Railway Companies.

[c] Does not include depreciation and Sinking Fund charges.

[d] Not available.

* From the *Census of Electrical Industries, 1922* (United States Department of Commerce, Bureau of the Census, Washington: Government Printing Office, 1925). Supplemented for missing data by Census for years indicated.

10. Development of a National Telephone Service *

The first person to hear the human voice by telephone is still living. The first name to appear on the payroll of any organization giving telephone service is still on our payroll. A member of the first Board of Directors of the first telephone company still sits on our Board. It is still less than half a century since the invention of the telephone, so that what I have to say must be considered only a part of the first chapter of the history of telephone service.

The story of how Alexander Graham Bell, teacher of deaf mutes, a student and teacher of the laws of speech, as had been his father and grandfather before him, studied and experimented in the belief that the human voice could be carried to a distance by the electric current over a wire, has been often told. The story has all of the thrills of a romance: picture this young teacher with a great idea but with none of the financial resources necessary for experiment; then, after he had succeeded in communicating his enthusiasm in some measure to the fathers of two of his pupils, with financial help from them, working persistently, sometimes in a cellar, sometimes in a shop attic and sometimes in his boarding house—often with discouragements and only occasionally obtaining results which renewed his hopes, but always with faith that the thing could be done.

In June, 1875,—fifty years ago—he first heard a sound which had been electrically carried over a wire. It was not the sound of a human voice, but it was a sound.

In the following March, his voice was carried over the wire from one room to another in his boarding house and was heard by his assistant, Thomas A. Watson.

The theory was demonstrated: the invention, crude though the apparatus was, had been made.

His financial backers were Thomas Sanders and Gardiner G. Hubbard; and Mabel Hubbard, at first his pupil, had become the rival of the telephone in his heart and mind, and it was her encouragement which led him to go to the Centennial Exhibition in Philadelphia where the telephone was on exhibition (but had received scant attention), so that he was in attendance when Dom Pedro, Emperor of Brazil, who was being escorted through the

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* H. B. Thayer, "Some Significant Steps in the Development of a National Service;" excerpts from an address before the Vermont Historical Society on June 24, 1925, at Montpelier, printed in *Bell Telephone Quarterly*, IV (July, 1925), 179-210; figures brought up-to-date as of Dec. 31, 1927, from *Annual Report.*

exhibition in company with some distinguished scientists, recognized in him the young teacher of deaf mutes whom he had previously met in his classroom in Boston and listened at the telephone receiver while Bell talked at the other end. ''My God—it talks!''—the Emperor exclaimed.

Professor Bell was a man of vision. As early as 1878, when the telephone had barely emerged from the laboratory, when speech by telephone was possible, but barely practicable, he wrote this:

> "It is conceivable that cables of telephone wires could be laid underground or suspended overhead, communicating by branch wires with private dwellings, country houses, shops, manufactories, etc., etc.,—uniting them through the main cable with a central office where the wire could be connected as desired, establishing direct communication between any two places in the city. Such a plan as this, though impracticable at the present moment, will, I firmly believe, be the outcome of the introduction of the telephone to the public. Not only so, but I believe, in the future, wires will unite the head offices in different cities and a man in one part of the country may communicate by word of mouth with another in a distant part.
>
> "Believing, as I do, that such a scheme will be the ultimate result of the telephone to the public, I will impress upon you all the advisability of keeping this end in view, that all present arrangements of the telephone may be eventually realized in this grand system."

The original patent on the telephone was owned in partnership by Thomas Sanders, Gardiner Hubbard and Professor Bell, Sanders and Hubbard being the financiers and business managers. They also were men of vision, thoroughly imbued with the plan of building up a national service. I have often wondered whether they would not have received greater material reward for their efforts if they had been content to manufacture and sell telephones and leave to someone else the future of telephone service, but judging from their correspondence, that thought did not enter their minds. With great personal sacrifice they put money into the business but there is no suggestion in their correspondence that they thought of taking any out. Apparently their whole purpose was to build up a business to give telephone service. Probably they were not entirely altruistic but were disposed to build and wait.

A real discoverer or a real inventor usually starts up a flock of claimants and pretenders, ranging from those who have almost accomplished the result, to those who, on no real foundation of fact, fabricate a case for the purpose of robbing the rightful winner of his reward. Professor Bell's experience was no exception. The announcement of his invention was followed by claims involving the greatest patent litigation up to that time, lasting about twenty years; that is, through the whole seventeen years' life of the original patent, and three years after it had expired. Some of these claims were taken up by the Western Union Telegraph Company, and for the first two or three years the infant industry found itself in competition with one of the most powerful corporations of that time. The effect of this during the first two or three years was largely increased difficulty in inducing men to put their time and money into the promotion of an entirely new enterprise. Both Mr. Hubbard and Mr. Sanders had other interests and other work, and they put into the business more money than they could really spare. They formed a corporation, but had difficulty in distributing the stock. They needed a business organization, but did not have the money to support it, but they needed most someone of force and ability to take the business management of the enterprise.

Mr. Hubbard, as member of a Congressional Commission on Postal Affairs, had met Mr. Theodore N. Vail, who was then Superintendent of the Railway Mail Service, and had become impressed with his ability, and he and Mr. Sanders rather reluctantly came to the conclusion that they could pay him $3000 a year salary, although Mr. Sanders impressed it upon Mr. Vail that he did not personally guarantee its payment. The enterprise was having what we in Vermont call ''pretty hard sledding.''

At about this time (in 1878), William H. Forbes of Boston became financially interested in the enterprise. The Company was poverty-stricken and the resources of the Western Union Telegraph Company were concentrated against it.

These two men, Forbes and Vail, brought to the struggling business what was needed to put it on a firm foundation,—business sagacity, generalship, and the confidence of financiers.

They settled the contentions with the Western Union Telegraph Company and soon the public began to realize the possibilities in what had previously had little more than the attraction of a novelty. Their Company, the National Bell Telephone Company, had issued capital to the amount of $850,000. Within the year, from November 1878 to October 1879, the market price of the shares went from about $50 to $800 per share. That was the period in which the tradition that there was an enormous profit in the telephone business took root.

In the spring of 1880 the American Bell Telephone Company was organized under a special Act of the Massachusetts Legislature and it is significant that one of the prominent features of the charter was the right to hold stock of other companies; significant because, as I shall attempt to show, stock ownership in subsidiary companies was one of the essential parts of the plan in their minds for the development and operation of a nation-wide telephone service.

Mr. Forbes became President and Mr. Vail, General Manager, of the new corporation. At that time, there were less than 30,000 telephones in service in the United States, and they were in 138 cities and towns, unconnected with each other by telephone lines.

During the following five years, the fabric of corporations and contracts defining their relations, departments and all that went toward making a working system to carry out that policy, was constructed. The policy was to carry out the dream of Professor Bell—to construct and operate a nation-wide telephone service; so that within the boundaries of this country, all that is possible in telephone service should be possible to all.

The system as then constructed is substantially as now operated; a parent or headquarters company, sectional operating companies, a manufacturing organization and an organization to furnish service connecting telephone users in different operating districts—the system which we call The Bell Telephone System.

The plan provided district operating companies in touch with the growth and the requirements of the communities they served, with stock ownership by the parent company in order to insure uniform policies and uniform standards of service. At first there were many of these operating organizations, but as economy of operation has dictated, they have been consolidated into fifteen operating organizations covering in their operations the whole country.

They recognized the importance of a uniform standard of excellence in the apparatus to be used in transmitting and receiving the voice current and retained in the parent company the obligation to furnish to all of the operating companies the transmitter and the receiver.

They, therefore, organized in January 1882, a manufacturing corporation in which the parent company was a large stockholder, under obligation to provide whatever devices might be required by the operating companies at reasonable prices. This involved an obligation on the manufacturing corporation to acquire licenses under the patents of others, if necessary.

But, in order that this relationship should always be an advantage which the operating companies could use, and never a burden that they must carry, they left the operating companies free from any obligation to buy of their manufacturing company. This studious care to protect the operating companies in untrammeled development—to help and not to hinder—is characteristic of the whole plan.

It was planned and always has been the part of the parent company to perform for the whole system the functions of a general staff of the System. It has employed scientific investigators and maintained laboratories and experimental shops where the aim is to develop the most economical and efficient apparatus and construction and maintenance material, looking as far as possible into the future requirements of the public. All of the methods of work in the various departments are studied and standardized. It has coördinated the financing of the system and in general has done all of the things which could be done more efficiently by one agency for all of the companies, than by each for itself.

By 1885, the operating companies had made such development that it seemed possible to extend the range of conversations, and the American Telephone and Telegraph Company, entirely owned by the parent company, was organized to interconnect the telephone users in the districts of the operating companies. When that was done, the plan for a national service, developed before 1882 and provided for by the inter-company contracts, came into complete operation.

Counting from the invention of the telephone, the end of five years saw the plan completed, which has been followed practically without change, in establishing the nation-wide telephone service as it exists today.

It must be remembered that in the early eighties, not only was the art of telephony new, but was true of all of the applications of electricity to the service of mankind, except the telegraph, and those years were marked by development of apparatus and materials, methods and men, and a healthy expansion of the business, hampered somewhat by the constant patent litigation.

In the *Annual Report* of 1892, the President says:

> "It is now possible from this room (in Boston) or from any properly appointed station on this system, to talk north and east to Augusta, north to Concord, N. H., to Buffalo, N. Y., west to Chicago and south to Washington, and, of course, to the principal cities intermediate.
>
> "It may be interesting to note that within that territory live and do

business, something more than one-half of the whole population of the United States.

"That this constitutes an addition to the social and business facilities of the country of far reaching consequence, needs, of course, not to be added."

At that time, after about fifteen years' growth, there were about 230,000 telephone stations in the United States (about as many as the present growth of three or four months).

In 1893 the original Bell patent expired although the litigation over it is still continued.

The Company owned or controlled many other patents covering important improvements in the telephone or subsidiary apparatus, but never again made any serious attempt to enforce patent protection.

Patent protection had served its purpose by furnishing the measure of control or influence necessary to direct the introduction of the telephone in accordance with the purpose of a national service by a closely knit organization.

The Company was prosperous and the business profitable, but not extravagantly so. There was a popular opinion that it was something like a gold mine. I remember at times meeting men who claimed to have had the opportunity in the beginning to buy the Bell patent for trivial sums, and who were fond of calculating the millions they lost by not taking advantage of the opportunity. It was frequently stated that the patent was the most valuable one ever issued.

The fact is, so far as I have been able to find, that no one ever had an opportunity to buy the Bell patent from the original owners, and while I think it was the most valuable one ever issued, the value was principally to the public. The profits in excess of moderate dividends were left in the business. No large fortunes were made out of it even by the pioneers. But this popular opinion that it was a very profitable business led people all over the country to establish so-called competing companies after the expiration of the original patent, Before long there was hardly a community in the country which was not served by two companies, each having a separate list of patrons and a few in common.

Perhaps this competitive movement was fostered to some extent by the general public feeling of revolt against large corporations which was at its height during this period. There was the feeling that with size went power and that there could not be power without abuse of power. This feeling manifested itself in onerous restrictions which were placed upon this Company by the Legislature with reference to increases in its capital; so that at the same time it stimulated public favor in the small corporation and hampered the operations of the large corporation.

In 1900, it became necessary to change the legal domicile of the parent company, which could be more properly called the headquarters company, and it was accomplished by transfer of the property of its subsidiary, the American Telephone and Telegraph Company, a New York Corporation, and the exchange of the shares of that company for its own shares. As a part of this legal reorganization, a part of the surplus which had accumulated in the preceding twenty-five years through undivided profits and the receipt of premiums on stock issues was capitalized, with a proportional adjustment in the dividend rate. The ownership and operation of the Long Distance Lines, which had been a separate corporation, thereby came into the parent company organization.

The telephone companies not licensed by, or operating as a part of the Bell organization, were called competing or independent companies, and between 1900 and 1905 they reached the summit of their strength. There are not accurate figures as to the number of stations they operated, but I have the impression that it did not at its height differ widely from the number operated by the Bell organization.

They did not have a central organization and a centralized financial strength. They did not have a complete scheme of interconnection between communities and in many cases were not soundly financed.

The principle of two agencies rendering telephone service in the same community or communities is economically unsound and could not survive. It has, however, taken a long time for the public to fully realize that this so-called competition is not real competition; that the public does not have the choice between two complete services, but it either pays to one company for a partial service or to both companies in order to get a complete service in the community served. It is now rapidly disappearing. In some cases the Bell plant has been sold to the independents and in some cases the surviving company's plant has been connected with the Bell National System and so the ideal of a nation-wide service has been maintained.

Now let us see what in less than a half century has come to this country out of the dreams of Bell and Sanders and Hubbard, and the plans of Vail and Forbes: The Bell Telephone

System—with its investment of over three billions of dollars, contributed directly by 423,580 stockholders, and unknown thousands of holders of other securities; and indirectly through savings banks and insurance companies, and other similar institutions, by perhaps millions more; giving employment directly to about 308,911 people, and indirectly to thousands more; with 18,365,000 stations in the cities, towns and villages and on the farms all over the country, connected together in one great network for intercommunication, and used to the extent of over sixty million conversations a day, some of them between points thousands of miles apart. And the end is not yet.

11. Telephone Service in 1887 *

An early advertising circular put out by the Bell Telephone Association affords interesting material upon rates, character of service, and customer-relationships.

"The proprietors of the telephone, the invention of Alexander Graham Bell, for which patents have been issued by the United States and Great Britain, are now prepared to furnish telephones for the transmission of articulate speech through instruments not more than twenty miles apart. Conversation can easily be carried on after slight practice and with the occasional repetition of a word or sentence. On first listening to the telephone, although the sound is perfectly audible, the articulation seems to be indistinct, but after a few trials the ear becomes accustomed to the peculiar sound and finds little difficulty in understanding the words.

"The telephone should be set in a quiet place where there is no noise that would interrupt ordinary conversation.

"The advantages of the telephone over the telegraph for local business are:

> 1st. That no skilled operator is required, but direct communication may be had by speech without the intervention of a third person.
>
> 2nd. That the communication is much more rapid, the average number of words transmitted by the Morse sounder being from fifteen to twenty, by telephone from one to two hundred.

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* Circular reprinted in the Bureau of the Census, *Special Report on Telephones and Telegraphs* (1902), p. 65; quoted in J. Warren Stehman, *Financial History of the American Telephone and Telegraph Company* (Cambridge: Riverside Press, 1925), Chap. I, p. 67.

> 3rd. That no expense is required, either for its operation, maintenance or repair. It needs no battery and has no complicated machinery. It is unsurpassed for economy and simplicity.

"The terms for leasing two telephones for social purposes, connecting a dwelling house with any other building, will be $20 a year; for business purposes $40 a year, payable semi-annually in advance, with the cost of expressage from Boston, New York, Cincinnati, Chicago, St. Louis, or San Francisco. The instruments will be kept in good working order by the lessors, free of expense, except for injuries resulting from great carelessness.

"Several telephones can be placed on the same line at an additional rental of $10 for each instrument, but the use of more than two on the same line where privacy is required is not advised. Any person within ordinary hearing distance can hear the voice calling through the telephone. If a louder call is desired, one can be furnished for $5.

"Telephone lines will be constructed by the proprietors if desired. The price will vary from $100 to $150 a mile; any good mechanic can construct a line. No. 9 wire costs 8 cents a pound, 320 pounds to the mile; 34 insulators at 25 cents each; the price of poles and settling varies in every locality; stringing wire, $5 per mile; sundries, $10 per mile.

"Parties leasing the telephone incur no expense beyond the annual rental and the repair of the line wire. On the following pages are extracts from the press and other sources relating to the telephone."

13. Statistics of Communication Companies

TABLE 5

TELEPHONE COMPANIES,* 1902–1922

	1922	1917	1912	1907	1902
Number of Companies or Systems..	1,323	2,200	1,916	1,636	4,151
Number of Calls Originating with Systems Reporting	21,901,387,070	19,809,061,085	13,735,658,245	10,400,433,958	5,070,554,553
Total Income	$ 656,823,908	$ 372,501,800	$ 253,893,969	$175,750,446	$ 86,825,536
Total Expense	$ 560,159,965	$ 313,103,060	$ 202,567,644	$134,525,215	$ 65,164,771
Total Assets	$2,595,396,033	$1,665,120,922	$1,295,670,101	[a]	$476,359,895
Total Capitalization	$1,738,326,105	$1,169,073,870	$ 970,690,992	$739,876,688	$348,031,058
Number of Employees...........	290,333	244,490	183,361	131,670	78,752
Salaries and Wages..............	$ 341,537,822	$ 169,655,066	$ 96,040,541	$ 65,009,349	$ 36,255,621

[a] Figure not available.

* The statistics are from the Report of the Bureau of Census Telephones, 1922. Because of the lack of uniformity in Telephone Reports it is impossible to make a table which is absolutely comparable. The figures for 1902 are exclusive of "farmer or rural lines" but include some systems with incomes of less than $5000. The figures for 1907, 1912, and 1917 include all systems with income of $5000 or more, while those for 1922 include only those systems reporting income of $10,000 or more.

TABLE 6

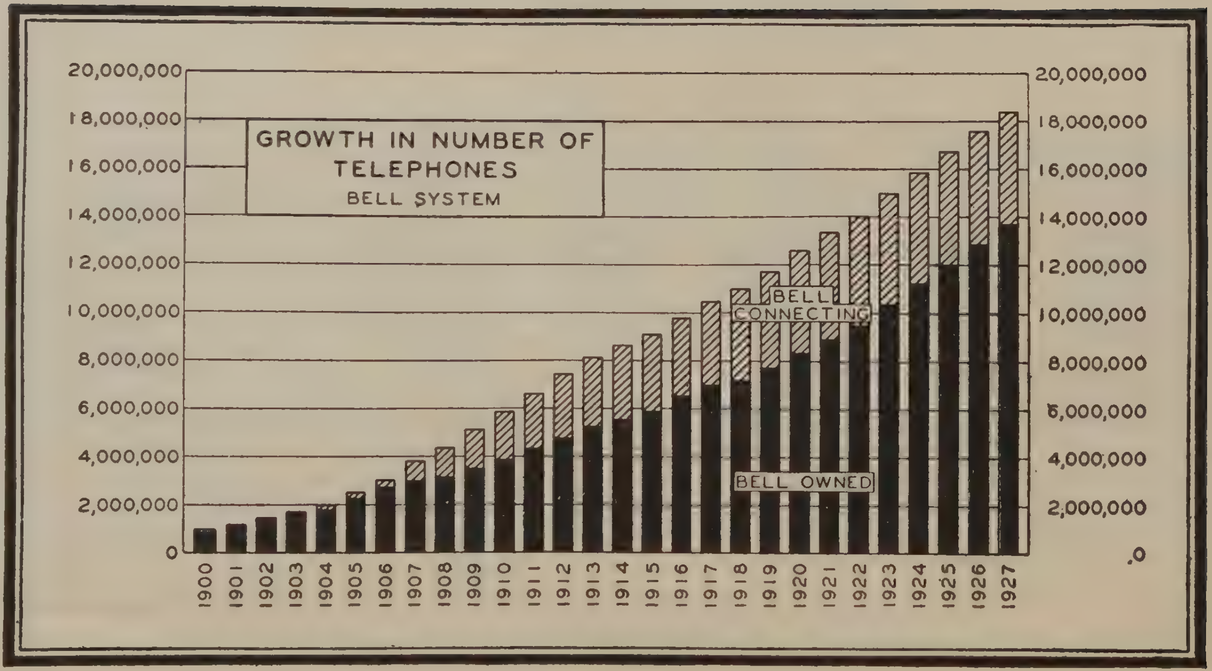
STATISTICS: LAND AND OCEAN CABLE TELEGRAPH SYSTEMS COMBINED * 1902–1922

	1922	1917	1912	1907	1902
Number of Companies or Systems..	24	27	27	26	25
Number of Messages	191,121,333	158,176,456	109,377,698	103,794,076	91,655,287
Total Income	$151,858,086	$109,703,428	$ 64,762,843	$ 51,583,868	$ 40,930,038
Total Expenses	$127,990,615	$ 91,871,159	$ 58,378,952	$ 41,879,613	$ 30,948,034
Total Assets	$459,469,284	$363,017,223	$298,288,906	$261,807,899	$195,503,775
Total Capitalization	$248,597,778	$229,087,786	$226,386,810	$220,293,575	$162,946,525
Number of Employees............	68,632	51,574	37,295	28,034	27,627
Salaries and Wages	$ 76,161,926	$ 39,643,911	$ 24,964,994	$ 17,808,249	$ 15,039,673

* The statistics are taken from; Bureau of Census, *Census of Electrical Industries*,—Telegraphs, 1922.

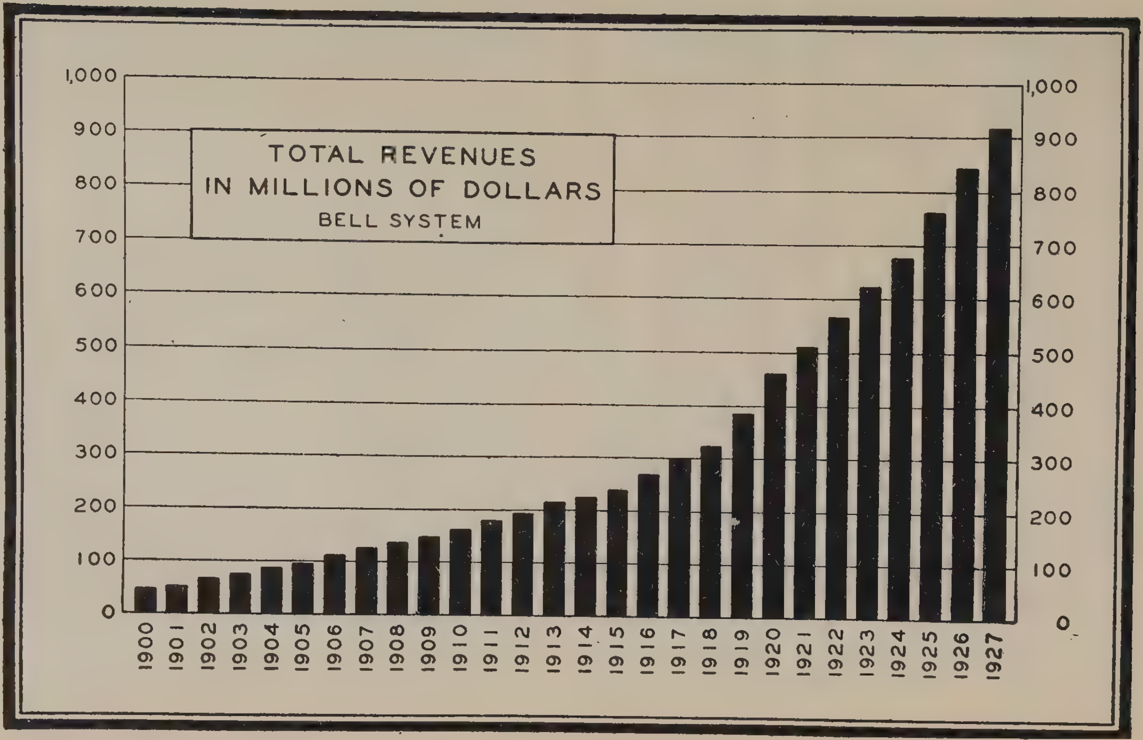
14. Growth in Bell System

Chart 7



15. Revenues of Bell System

Chart 8



16. Chronology of the Telephone *

1876	First complete sentence transmitted by telephone. First conversation by overhead line, 2 miles—Boston to Cambridge.
1880	30,872 Bell telephone stations in the United States. Conversation by overhead line, 45 miles—Boston to Providence.
1881	Conversation by underground cable, ¼ mile.
1884	Conversation by overhead line (hard-drawn copper), 235 miles—Boston to New York.
1890	211,503 Bell telephone stations.
1892	Conversation by overhead line, 900 miles—New York to Chicago.
1900	676,733 Bell telephone stations owned and connected.
1902	First conversation by long-distance underground cable, 10 miles—New York to Newark.
1906	Conversation by underground cable 90 miles—New York to Philadelphia.
1910	5,882,719 telephone stations in Bell System.
1911	Conversation by overhead line, 2100 miles—New York to Denver.
1913	Conversation by overhead line, 2600 miles—New York to Salt Lake City. Conversation by underground cable, 455 miles—Boston to Washington.
1915	First conversation by transcontinental line, 3650 miles—Boston to San Francisco. Speech transmitted for the first time by radio telephone from Arlington, Va., across the continent to San Francisco, over the Pacific to the Hawaiian Islands and across the Atlantic to Paris.
1920	12,601,935 telephone stations in Bell System.
1921	Conversation by deep sea cable, 115 miles—Key West, Fla., to Havana, Cuba. President Harding's inaugural address delivered by loud speaker to more than 100,000 people. Armistice Day exercises at burial of unknown soldier delivered by means of Bell loud speaker and long lines to more than 150,000 people in Arlington, Va., New York and San Francisco.
1922	Ship-to-shore conversation by wire and wireless between Bell telephones in homes and offices and the S. S. America 400 miles at sea in the Atlantic.

* American Telephone and Telegraph Company, *Report of the Board of Directors to the Stockholders for the Year 1927* (New York, 1928).

1923 Successful demonstration of trans-oceanic radio telephony from a Bell telephone station in New York City to a group of scientists and journalists in New Southgate, England.

1924 Pictures sent by telephone circuit from Cleveland to New York and from New York to Chicago.
Nation-wide mobilization of communication by wire and wireless for the United States Army on Defense Test Day.

1925 First telephone cable New York to Chicago put into service, October 1.

1926 Two-way radio telephone conversation between New York and London.

1927 Commercial trans-oceanic radio telephone service opened between New York and London; later extended to all points in the United States and Great Britain. Service to principal cities in Mexico established.
Television demonstrated, by wire between New York City and Washington, D. C., and by radio between New York City and Whippany, N. J.
18,365,486 telephone stations connected in Bell System.

17. History of Electric Railways *

Although the term "street railway" is ordinarily used interchangeably with "electric railway," a survey of street-railway history shows that the electric car is only the most recent of several forms of street-railway transportation. Antedating the introduction of electricity as a motive power in the 1880's, we find that in America during the second and third quarters of the nineteenth century horse-cars, cable-drawn cars, and steam-power systems were extensively used.

In 1831, the first "street car" track was laid by John Stephenson in New York, from Prince Street to Harlem, following the Bowery and, approximately, what is now Fourth Avenue. The horse-drawn cars which were used on this track had flanged wheels and were of the omnibus type. It is interesting to note that thirty of the forty passengers which a car carried were seated on the roof. This road was abandoned after an operation of about four years. In 1836, a street-railway was built in Boston and from that time on was developed throughout the country. At the peak of their development in 1890 these "John Mason Cars," as they were called, were operating over 5662 miles of

* Pamphlet of New England Bureau of Public Service Information, *The Electric Railway—History and Development*, 1924.

track. In Great Britain numerous experiments were made with horse-drawn cars and the first practical tramway system was installed in Liverpool in 1868.

This form of urban transportation was never entirely satisfactory. It was slow; it could not be operated to advantage on heavy grades; it was hard work for the horses. Accordingly, inventors the world over turned their attention to the development of some form of power suitable to the service. Various substitutes were tried, one of the chief being a steam car or steam motor with a trailer carrying passengers. A street-car of this type was run on Atlantic Avenue, Brooklyn, from December 25, 1875, to June, 1876, and was then sent to Philadelphia, where it ran on Market Street until nearly the close of the Centennial Exhibition. Similar cars were tried in Baltimore in 1876; in Dubuque, Ia., in 1877; and in various other cities. They were generally unsatisfactory.

Compressed air, ammonia, hot water, gas and carbonic acid were experimented with, but the first method to achieve any considerable measure of success was the cable-car, which was really the first workable substitute for the horse-car. It was drawn by a continuous cable driven by a stationary engine. The cable ran in a slot set beneath the street surface, between the rails, and its movement was transmitted to the car by means of a grip which could be made to seize or release the cable at the will of the operator. There was an experimental installation on a short elevated railway in New York in 1869, and in 1873 Andrew Hallidie built a cable-railway in San Francisco. The cable-railway is used at present in only a few cities, notably Seattle and San Francisco, in which the grades are too steep to permit the most efficient use of "trolley cars." Although the cable system has proved advantageous in such circumstances, and is capable of handling large numbers of passengers, its inflexibility, its dependence on one apparatus, the cable, and more particularly its extremely high cost, have led to its abandonment in most places.

Mention should be made of two types of urban transport which have developed to meet the peculiar needs for "rapid transit" in large and densely populated urban areas. Subways and elevated lines have been placed in operation in many large cities. The elevated railway is more widely used, 602 miles of track being in operation in the United States in 1922. At that time there were 326 miles of subway track. The elevated railway was first introduced in Berlin; in Brooklyn (1885); Chicago

(1892); Liverpool (1893); Boston and Philadelphia, and other cities. Steam locomotives were used on the New York lines until the substitution of third-rail multiple-unit electric operation, in 1901-1903.

The development of the surface electric street-railway is of comparatively recent practical significance. Its history is well outlined in the following article:

"The electric railways of the United States carried 16,000,000,000 people in 1923.

"This high total has been reached after only 36 years of operation and expansion. Although short lines were in operation at the time, the first complete electric railway system was established in Richmond, Va., by Frank J. Sprague in 1888. This came as a result of 50 years of experimenting on the part of science, followed by years of skepticism on the part of investors.

"When the Richmond Company was organized, there were about 19 electric lines in the world, 10 of which were in the United States. The total trackage of the 19 companies was only 60 miles. Yet, one year after Sprague's organization sent its cars over the first system, 50 companies were in existence in the United States alone, and the 40 miles of track in this country had grown to 100 miles. At the end of another year the number of companies had quadrupled, and the mileage had increased about 1200 per cent.

"The third year brought further phenomenal growth. The end of 1890 found 275 American companies, and 2250 miles of track. By the fifth year this had grown to 606 companies and 7470 miles of 'iron trails'; and the sixth year increased this to 880 companies and 10,860 miles. Expansion continued steadily every year, and today the United States can boast of 44,440 miles of city, town and interurban track, which, together with the cars, power plants and other equipment, represents an investment of $5,600,000,000—the savings of 550,000 people. More than 300,000 men and women are employed to keep the 107,000 cars in operation.

"In 1890 the average number of rides for each person in the United States was 32; in 1902 it was 61; in 1907 it was 85; in 1912 it was 100; in 1917 it was 109; in 1922 it was 114; in 1923 it was 145.

"The first practical electric line in America, as has been mentioned, began operation in Cleveland in 1884. The track was two miles long, and the cars were run by the sliding of an underground trolley in a slotted wooden box.

"The second practical line was built the same year in Kansas City by J. Henry, who deserves a place in the hall of street railway fame right next to Sprague. Henry's line is said to have given us the trolley rope and the word 'trolley'. This was a corruption of 'troller', the little four-wheeled carriage that ran on the wire and transmitted current through a flexible cable to the car. Before the introduction of the trolley rope it was necessary to have a small boy ride on top of each car.

"Henry also overcame other obstacles. He had to use horseshoe nails in bonding the rails, and copper wire for the trolley supply was then to be had only in 60-foot lengths.

"These practical demonstrations were the results of Michael Faraday's discovery, in 1821, of the fact electricity can be made to produce mechanical motion. Eleven years later, 1832, Henry developed the first motor; and three years after, Thomas Davenport, of Brandon, Vt., showed the world that electricity can be made to drive a car along the rails. To Davenport, a poor, uneducated, country blacksmith, belongs the honor of originating electric traction. In six years of hard labor he made a hundred motors, and at last saw his model roll forward on its circular track. His principle was wrong, however, and his work gave the world a big idea, but no direct results.

"Next came Robert Davidson of Aberdeen, a Scotchman, and took from America the honor of producing the first electric car to run on a standard gauge track. This was in 1838, only three years after Davenport's work became known. This car made several successful runs over a steam road.

"As early as 1841 the idea of using rail as current conductors was patented. In 1855, an Englishman, in trying to bring about telegraphic communication with moving trains, gave us in its first form what is today the trolley wire and pole. In the same year, in France, both the insulated trolley and the central station current supply were suggested. In 1861 Pacinnoti, in Europe, invented the reversible continuous current dynamo upon which all modern generators and motors are founded.

"It was the invention of the dynamo that brought an end to the first period and made final success possible. The 26 long years of effort between Davenport and Pacinnoti had been wasted. They in themselves constitute one of the tragedies of industry. Prior to the dynamo, the primary battery system used was not commercially practical. No progress could be made.

"Having now, by 1861, all the underlying principles of electric traction, it seems odd to the reader of today that so many years had to pass before commercial results were obtained. For it was 1879 before the first practical electric line was operated, and, as said before, 1888 had come before the construction of electric roads on a commercial scale became possible. But the length of time elapsed is the measure of the difficulty of the problem.

''It was in Germany, not America, that the first practical line was operated. In the late seventies Siemens, a German, and Edison and Stephen D. Field, Americans, filed claims for patents within three months of one another. Field, having been the first to enter preliminary papers, was given the honor. But Field did not get his line into operation before 1880, whereas the German began carrying passengers at the Berlin exposition in 1879. Siemens' motor could haul 18 persons in three small trailers along a one-third mile track at the rate of nearly eight miles an hour. He used the third-rail method.

''The first line operated outside an exhibition ground was also in Germany. This was at Lichterfelde, near Berlin, in 1881. It was one and a half miles long and its motor could carry 36 passengers at the rate of 30 miles an hour. The line is still in existence. It was in the same year, also, that between Charlottenburg and Spandau, the first effort was made to offer competition to the street-car horse.

''The first exhibitions of electric traction in the American western states were by Charles J. Van Depoele, a Belgian sculptor and inventor, who is said to have been the first actually to draw current from an overhead wire; and by Edison and Field, who operated a line in the gallery of the American Railway exposition in 1882 and 1883. Van Depoele made experimental installations in a number of western towns.''

18. The Troubled Trolley *

''These people,'' said a startled spectator in Cleveland last October, ''are dizzy!'' He was looking at the American Electric Railways Association's exhibit in the town's *salle d'exposition.* ''I see street-cars built to look like buses, and buses built to look like street-cars. One crowd says the first way will save the street-railways from extinction. Another crowd says that only the second way will do it. What hope is there for such fellows?''

Eight thousand street-railway officials from cities and hamlets

* Raymond S. Tompkins, *American Mercury*, April, 1928, pp. 400-408.

all over the United States came to this forty-sixth annual convention of trolley potentates and everyone was whispering the same question, "What hope?" and spreading his ears to catch the answer. That was six months ago and no clear reply is heard yet. The electric transit giant, moving about the land at his business of hauling America's city millions, finds his load and his income growing lighter as the plague of automobiles about his feet grows greater. He is young, too, as giants of industry go. Millions of able-bodied men living to-day remember when Rapid Transit first arrived with a whoop, sputter and clang, chasing horse-cars and horses off to the scrap-heap and the glue factory. It is not yet fifty years old in this country. But already its movements grow slow and jerky, it complains of pains in the head, and in many cities men snicker when they speak of it as rapid.

All this has happened like a flash, as the movements of history go. The horse-car horse first saw the handwriting on the stall in Cleveland in 1884, or in Baltimore in 1885. In either one or the other of these cities the first practical electric street car line in America began business: between the two there is a feud of long standing over the matter. But it appears certain that when the first really complete electric street-car system began operation a bit later in Richmond, Va., there were only nineteen electric lines in the world, ten of them in the United States, and only sixty miles of electric railway trackage on the whole surface of the globe.

Forty-three years later, in 1927, there were 46,750 miles of track, cars and equipment worth five and one-half billions of dollars, 300,000 employees getting pay envelopes which supported, presumably, a million and a half persons, and 1,300,000 stockholders. Yet, with all this property and capacity for work, the business stands, still in its youth, on the brink of a troublous and uncertain future. To-day its leaders battle with tidal waves of automobile traffic; they clamor for their place in the streets, the place of supremacy they once made for street-cars and never expected to see challenged: they view with concern the lessening monthly returns of revenue and passengers, the mounting public call for better service, the call of a public that has tasted the delights of motoring and wants more; and they face public utility commissions that are stony-faced and bored when they tell their sad story and ask that car-fares be jacked up. The ghost of the horse-car horse whinnies in glee over this nightmare age in rapid transit history.

The sins of the old feudal lords of electric traction come back to haunt their well-meaning descendants. A decade or two ago the popular symbol for all that was selfish and corrupt in public life was the traction baron. Monopolizing the municipal carrying trade, at the rate of a nickel for a car ride, some of the primeval operators so thoroughly educated the country to believe in the fabulous wealth, power and ruthlessness of the street-car business, built up on a five-cent fare, that the more honest modern operator finds it hard indeed to induce the public to weep with him and help him when he needs a ten-cent fare.

This, however, worries him less than the suggestion (made more frequently two or three years ago, but still mouthed upon occasion), that street-cars are obsolete or approaching obsolescence. When, for example, the most recent automobile show opened in New York, a leading automobile manufacturer gave out a column interview to a New York paper, saying, in reply to the reporter's question, "Should all street-cars go?"

> There is a place for the street-car in our nation-wide transportation systems, but there is no place for it in the congested centers of great cities. Surface trolley lines should give way to busses. Watch a trolley-car turn the corner at Madison avenue and Forty-second street and you will see what an obsolete method of transportation the surface street-car is in a congested city like New York.

Such talk is plainly very bad for the street-railway man's peace of mind, because he knows that a great many people are ready to believe it. The street-cars of the United States still carry sixteen billions of passengers in a year, but they are not all satisfied customers; in fact, the job of making a customer satisfied is now a harder job for the street-car industry than for almost any other business, because its service is picking the customer up and transporting him bodily, and it is at once held responsible for every discomfort and delay that he encounters. Since discomforts and delays increase as traffic congestion increases, and since the street-car operator cannot help the traffic congestion, there he stands at bay, with sixteen billion customers using his product but most of them far readier to applaud his enemies than to applaud him.

This is no place to go into the frightful transit muddle in New York. But so far as the automobile man's statement is concerned, one thing always has stood out clearly in all the reports of all the experts called in to make a show of unscrambling New York's traction eggs. That is the fact that the New York electric surface lines are necessary and, for the most part, must stay. Electric railway men get a great deal of consolation out of these reports. They show that traffic on the New York surface cars had a steady growth until 1924, when the staggering total of 1,047,634,626 fares was collected; and that while this figure fell off to 997,251,460 fares in 1927, no further permanent or critical falling off is now indicated. C. E. Smith, of St. Louis, the latest consulting engineer to put his hand to the New York problem, said, in answer to the automobile man's claims that "surface trolley lines should give way to buses":

> If the street-cars were abandoned and their passengers carried by automobiles and motor busses, it would add the finishing touch to New York's traffic congestion.

But the automobile man's blast against street-cars has been heard beyond the boundaries of New York. Indeed, it is in the rest of the country that such clarion calls echo loudest; New York is always so full of noises. The provincial American, seeing a statement like that in the paper, calls up facts that seem to him to give it body and substance. What has been happening? In the thirteen years from 1915 to 1927, inclusive, 259 trolley companies with a total capitalization of $1,627,973,797 and a total track mileage of 15,698 miles went into the hands of receivers. From 1915 to 1927, street-car service was entirely abandoned by 253 companies, and partially abandoned by 511 companies. East and West, North and South, electric traction properties, former money-makers, have been going under the hammer during the past ten years for anything they would bring, two score years after the glorious birth of the industry as the permanent solution of the municipal transit problem.

These crashes have kept almost perfect step with the growth of the automobile. In 1915 a little railway in West Orange, N. J., with a mile and a half of track went up the spout: it was the first to succumb. In 1916 small companies shut down in West Virginia, Oregon, Pennsylvania, New York and Massachusetts, with a total of thirty-nine miles of track. In 1924 the total abandoned mileage in the country was 379 miles; in 1925, it was 505 miles, and in 1926, 763 miles (partial and entire abandonments included). These are the figures for each year, not the cumulative figures. During the decade ending with 1927, track abandonments amounted to 3800 miles, although during the same period about 4060 miles of new track were laid.

The receiverships, in 1915, involved twenty-seven companies, with a total capitalization of about $80,000,000. Only sixteen companies went into receivership in 1926, but they were larger ones, involving a total capitalization of more than $135,000,000. While street-railway properties were being thus cut down in their youth, the freeborn American was joyously buying automobiles. We were seeing the passing of one age of joy-riding and the birth of another. The sheiks and flappers of the days just before and after the war, discoverers of the delights of the open-sided cross-country street-car with the front seat just abaft the motorman's coat-tails, where the breezes blow full and free, had now discovered something better and more private—the gasoline buggy. There had been only 450,000 passenger automobiles in the entire country in 1910—one to each two hundred persons. In 1917, there were 4,657,000, or one to each 21 persons; while in 1926 there was, theoretically, a private car of some kind to every family in the nation, or a total of 19,237,000. No wonder the cheek of the street-car man blanched, and the sovereign householder in a city where the sweating car company was trying to boost fares, chortled and sat down and wrote to the editors of the local papers, "We now hear that street-cars are obsolete and ought to be chased from the streets. This is what we have been saying all along. Wake up, citizens, and throttle this octopus!"

The trouble to-day is that the street-railway industry has a job with so many sides to it—more sides than the job of any other sort of public utility. It is closer to the public than any other. A gas and electric company is but a push-button in the wall or a cooking range and ice-box in the kitchen, and a monthly bill; a telephone company is an instrument on a table and a woman's voice; but the public's business with the traction company involves actual physical contact every day with its chariots and its charioteers, and the payment of a toll at every contact. This tremendous multiplicity of personal transactions to the extent of sixteen billions in a year naturally breeds trouble. The American gives up $2000 gladly for a shinier automobile than his neighbor's, but he groans with pain at two cents extra on an unescapable necessity. This is a sad economic and sociological fact, but it has to be reckoned with by the public service commissions.

In addition, with the rise of the automobile, the street-car companies have lost their old monopoly on the transportation they sell, while the other public utilities still hang on to theirs, there being no substitutes for electric lights or telephones. Thus the traction industry's job has been and still is to convince the public of its essentiality as an industry, its sincerity in promises of better service, and its need for room to move in the streets. Unfortunately, that public can now adopt some other mode of getting about if it wants to, and is therefore slow to weep over the traction company's problems. So the company has an uphill job, and the hill is a steep one.

One may understand how steep it is when one realizes that all this educating has to be done while the industry is trying to wring higher rates of fare from the people it is trying to educate. There has been, ever since street-cars of any sort existed, a firm belief in the United States that "nickel" and "street-car ride" are synonymous terms. Most car companies had succeeded in getting more than a nickel before anybody proposed a constitutional amendment on the subject, so that the average fare in the country is now 8.01 cents, but the five-cent fare was actually written into many traction franchises at the start, running for twenty, forty, or fifty years. It still exists in New York. Well-informed persons know that New York's five-cent fare is nothing but a political fetish and that a surface car, subway or elevated ride actually costs about eight cents, the New York taxpayer paying the difference in taxes. But the average man clings to pleasant memories of the good old days, and the five-cent fare is one of them.

The war saw an attack on the five-cent fare, but it did not see the last of trouble for the street-car operators. Indeed, it saw the real beginning of it. In 1919, the first full year of peace and good will amongst men, a total of forty-eight street-railway companies went to the wall, involving the crash of more than $320,000,000 in securities. This figure, however, has not been equaled in any year since, and was only approached in 1918, when twenty-nine companies, worth more than $230,000,000, went bankrupt at the very height of the struggle to make the world safe for democracy.

Sudden jumps in operating expenses with no corresponding increases either in rates of fare or in passenger traffic were responsible for the swift dawn of evil days. Back in 1914, operating expenses consumed only a little more than 50 per cent of revenues, the rest going to taxes, income deductions, and dividends, leaving a surplus of about 10 per cent. But in 1918 operating expenses jumped to 71 per cent, and in 1919 and 1920 to 73 and 77 per cent respectively. Dividends and surplus were completely wiped out. Wages, keeping pace with increasing living costs, went up 50, then 100 per cent, and wages form the bulk of a street-railway's operating costs. Hourly wages of conductors and motormen advanced from an index figure of 124 in 1918 (100 being the 1913 index) to 218 in 1920.

Meanwhile, the average carfare for the country stayed at five cents throughout 1917 and 1918 and part of 1919, when it advanced to 6.24 cents. Out of 303 cities with populations of more than 25,000, 125 kept the nickel fare throughout 1918, while seventy-nine cities went to six-cent fares; thirty-three to seven-cent fares, and twelve to eight cents. The rest adopted charges for transfers or established zone systems. In 1919, the year of many receiverships, eighty-two cities still clung to the nickel fare, but twenty-six others had advanced to ten cents. In 1920, there were fifty-eight ten-cent fare cities and only thirty-one five-cent cities. From then on, the ten-cent cities increased, and the five-cent cities diminished, until, by the end of 1927, 232 cities had basic ten-cent fares, 115 of them with populations of more than 25,000; while the number of cities of any size with single five-cent fares became negligible.

But salvation had come too late for many of the companies. They had been built on sand instead of on rock. The fact is that the street-railway industry in the United States, as most of the soothsayers in the business now agree, got its growth too soon. Between the middle eighties and 1912, street-car lines sprang up all over the country. Electric cars were regarded as the brand of civic progress, and town boosters everywhere who walked in their sleep could be seen outdoors in their night-shirts measuring off trolley tracks by moonlight. In the ten years prior to 1912, the street-car trackage of the United States increased from 22,000 miles to 41,000 miles. No hamlet was too small to have car lines. There was supposed to be some magic in them. They were built, not to serve towns that needed them, but to build towns where no real towns existed. Realtors saw a golden age of huge sales based on street-car selling talk. . . .

The notion of connecting more or less remote communities by electric interurban roads was conceived and pushed rapidly. By 1912 this enthusaism began to slow down, but by that time virtually every American community of 10,000 or more inhabitants had a street-car line, and cars were to be found in many even smaller villages. Most of the small lines and even parts of some of the big ones were built entirely on hopes. But when profits failed the promoters began to slow up, so that between 1912 and 1917, the trackage in the country increased by only a little more than 3000 miles, the total in 1917 being 44,835 miles. And in 1922 there were only 43,932 miles. The deflation was under way. Street railways that were soundly built and financed weathered the war storms, though with difficulty, but those that were not went under.

Thus, during the last four or five years the street-railway business has presented the picture of a shrinking industry, with receiverships and abandonments multiplying, while earnings staggered uncertainly, passenger traffic declined, and automobiles increased. It has been a short and not illogical step to the popular conclusion that street-cars everywhere are headed for the junk pile. On top of all the other things has come the motor bus, single or double-decked, with fancy trimmings and rubber tires, and the ability to run anywhere without rails or overhead wires.

But the great minds of the industry still remain optimistic. They declare that the street-car business is just beginning to get its sea-legs. Receiverships, they point out, have lessened considerably. Compared with the dark year of 1919, when forty-eight companies went into bankruptcy, only thirteen companies went broke in 1927, with a total trackage of but 624 miles. Moreover, the street-car mileage in receivership on January 1 of this year showed a decrease of almost 13 per cent under January 1, 1927, and seventeen companies, comprising 1099 miles of track, emerged from receivership in 1927.

At the close of 1927, fifty-one companies were still in receivers' hands, but at the close of 1926, fifty-five companies had been there. For the first time since 1923, no company of great importance got into serious trouble last year and only two companies with more than 100 miles of track were included in the list of new receiverships. These were the Chicago, South Bend and Northern Indiana Railway, and the Des Moines City Railway. If these failures brought grief to the industry, the emergence of the United Railways of St. Louis from under the ether brought joy. This big company, with 450 miles of track, has resumed service under a new franchise agreement with a seven-cent fare. The Chicago Surface Lines, one of the biggest properties in the country, is still in receivership, but is not involved in financial difficulties. Its franchise has expired, and a receiver has been appointed to protect the bondholders.*

* Editor's Note: The Chicago Surface Lines have never been in receivership; the Chicago Railways, one of the operating companies of the Chicago Surface Lines, has been in receivership since 1927.

The reports on abandoned trackage for 1927 also encourage the street-car men, who point to the total of 763 miles abandoned in 1926 as against only 593 miles in 1927. They point further to the fact that the companies that abandoned all their trackage in 1926 comprised a total of 577 miles, while those that stopped service entirely in 1927 had a total of only 161 miles of track. Against the figures on abandoned trackage the industry's leaders place the figures on new trackage built and old trackage reconstructed, the latter item reaching nearly 900 miles, which beats all track reconstruction records for the past ten years. The extensions of new track, about 350 miles in 1927, were exceeded, however, in 1917, 1918, 1919 and 1924.

In many cases of abandonment, only the street-cars and tracks and not the transportation service were abandoned. The service was continued by buses. The bus problem has plagued the street-car companies for the past six years. Buses were first used by independent or jitney operators and threatened costly competition with the trolleys. These first jitney buses were high-riding, noisy, and uncomfortable, but they offered the weary strap-hanger something new. Most of the street-railway men quickly saw that the bus, if developed and used against them, might put street-cars on the shelf. So they decided to make the bus their own and attend to its development themselves. To-day, wherever buses are operated in big cities, they are usually operated by the street-railway companies, on the theory that the place of the bus in urban transportation is as an auxiliary to the street-car system, which is still the best and cheapest surface system for handling masses of people quickly; and that the bus is the logical vehicle to use when extensions of service have to be provided.

Thus it is that out of more than 60,000 miles of service furnished by street-car companies in the United States, 46,000 miles are now in street-railway track, and about 18,000 miles are in bus routes. The street-railway trackage represents a development of more than forty years; the bus routes represent a growth of the last seven years. Last year's bus extensions amounted to 3200 miles, more than in any year since 1921, when the bus first began to be a street-railway arm; and there are now nearly 10,000 buses in the country operated by 351 street-railway companies. It is interesting to compare the bus extensions of 3200 miles in 1927 with the street-car track extensions for the same year of only 350 miles.

The absorption policy of the street-car people in the matter of buses at first satisfied the bus manufacturers, who, like all automobile salesmen, are very pushing fellows, but of late it has begun to irk them, and they have begun denouncing the theory that only street-railway men should develop bus lines. Street-railway men, they declare, are congenitally opposed to buses; they are backward-lookers and wedded to their outworn street-cars. Therefore, away with this coöperation with street-railways! *Automotive Industries,* a motor trade publication, said, in January, 1927:

> It has become increasingly apparent to those interested in promoting the use and sale of motor busses that maximum utilization of such vehicles is unlikely to be reached by leaving to agencies fundamentally opposed to their use the determination of where they are and where they are not suitable.

The response of the street-car men to this unfriendly note is that if the responsible bus builder is "building for to-morrow as well as to-day," he will realize that buses will not continue to sell unless they make money, and that they will not make money if the market is flooded with them and the passenger traffic split up. Most bus manufacturers are sticking to the coöperation theory.

But the adoption of the bus will not in itself save the street-railways, and the street-car messiahs are thus working night and day on other devices. It is not enough that they make more money by getting more for each street-car ride, for it is still easy, considering the fondly remembered five-cent fare days, to arouse the criticism that anything beyond a nickel is more than the traffic will bear. So it is necessary, while getting back some of the spread between costs and fares by increasing the latter, that they likewise bring back some of the lost riders.

The industry, therefore, is in a ferment to-day over Service. This fever was responsible for the exclamation of the startled citizen reported at the beginning of this article. Street-car builders, driven by the idea that the public demands luxury even in its necessities, are building cars that look like buses. Bus manufacturers, for their part, faced with the fact that the bus will not hold street-car crowds, are building buses nearly street-car size, with the motors beneath the bodies instead of out in front.

Throughout the country street-car men are calling to each other about their duty to the public. But the public, obsessed with the old idea that anybody who has anything to do with street-cars never has cared a hoot about it and never will, regards this sudden tenderness with suspicion. Here and there, however, it is being broken down, if only slowly.

Public relations, until a few years ago regarded by street-car companies as something abhorrent, is now something that few of them fail to clutch at. They display almost parental solicitude over choleric citizens pop-eyed with rage at the motorman who ran by without stopping, where the old masters used to have an office boy throw them out. Conductors of the old school who used to sleep in their uniforms, or looked like it, now have to run to the pressing club once a month, and are being herded in droves toward the shoe-shining parlors. In Detroit and Baltimore there are full-length mirrors for their use. Courtesy is preached night and day; "every man a salesman of the service" is a slogan on many systems. Down in Texas they teach the men how to make speeches at Rotary and Lions Club meetings. In Nashville, Tenn., during a Safety Education Week, they had motormen and conductors making speeches from the car platforms to people in the streets. The speeches were carefully prepared for them beforehand, and all began, "Ladies and Gentlemen, I ask your kind indulgence for just a moment," and ended, "The Nashville Railway and Light Company wants to render you safe, courteous service. We thank you!"

Many of the companies will not undertake anything new without first asking the public to vote on it. The Texas Electric Railway, in Dallas, fitted up a car with several varieties of seats, in different styles of plush and leather, and passengers were invited to try them all and vote on little cards for the ones they liked best. Most of the people voted for a type to which the management had given little consideration. In El Paso, the conductors are instructed to listen in on comments about the company and to record them on Better Service slips, which they turn in to the management. In the same town the car operators were supplied with stacks of "Merry Christmas" cards to hand to every customer on Christmas morning.

The cult of ride-merchandising has arisen, and the prophets of the industry are clamoring that more ride-selling be done. This ride merchandising takes the form of advertising, in newspapers and on the cars, both inside and outside, or the form of stunts. Statisticians for the American Electric Railway Association, through which the various companies exchange ideas and discuss and adopt policies, report that about $6,000,000 a year is being spent to-day on street-car advertising—not the soup and cigarette ads in the cars, but advertising bought and paid for by the car companies to tell the public about themselves. This, it is expected, will soon reach $10,000,000, the sum spent for advertising in 1926 by the light and power industry.

Slogans are being broadcast, such as "The Safest Place on the Streets—the Street Car," "Around the World Fifty Times Without a Breakdown," "You Don't Deliver Your Own Mail —Why Drive Your Own Car Downtown?", "Leave Your Car and Worries at Home—Use the Street Cars," "Let the Motorman Find Parking Space," "Read While You Ride," and "Cheaper Than Walking—the Street Car." The big electric supply companies, among whose best customers are the street-railways, are coming into the big cities with full-page newspaper advertisements, telling the inhabitants what their street-car service means to them. The street-car billboard ad is appearing on the landscape.

"You can't sell cotton goods in a silk age," one street-railway booster has said, and backward companies are being rebuked while more go-getting executives are praised for their efforts to make car riding one endless round of joy.

Startling changes are being exhibited in the street-cars themselves. Great attention is being given to more comfortable seats. The old street-car slat seats are being turned into voluptuous things of plush, leather, imitation leather and a stuff called kemi-suede, and are being built like Pullman seats of the bucket type. Such seats have been installed in cars in Joliet, Ill.; Atlanta, Ga.; Norfolk, Va.; and Grand Rapids, Mich. With them go handsome lighting fixtures in the ceilings, linoleum-covered floors, woodwork in gray and mauve tones, and compartments for the motormen where all the brakes, controllers and brake-rigging are hidden from the æsthetic passenger's gaze.

Cleveland has several two-car trains equipped with real leather-cushioned seats, built like Pullman seats. Baltimore recently saw inaugurated a similarly equipped car, with a smoking compartment added and match scratchers on the window frames. Tired business women have taken up smoking in it going home from their offices of evenings. Lighter cars, some made of aluminum, worm-gear driven so that noise will be reduced, are being built by the car-building companies, which are adding stream lines and bright colors.

Unfortunately, most of the street-railway men, with pockets thinly lined, have to stand off and regard these splendors with futile admiration. Depreciation reserves with most of the companies have been kept low for years by public service commissions in order that fares might be held down, and street-cars are supposed to live from twenty-five to fifty years. Hence the presence on the streets of many big cities, including New York, of old-fashioned cars that groan and rattle in every joint, while the progressive men in the industry loudly urge the purchase of new rolling stock, and frequently in vain.

Last year only 1182 new street-cars were bought by American companies, and only 767 of these were for city service, the rest being bought by interurban lines. This is the lowest figure for any year since 1907, the first year for which statistics are available. The companies complain that they simply haven't got the money, and most of their plans for higher fares include the argument that they cannot improve service and bring back lost riders without additional revenues immediately.

Fares in the United States increased 2 per cent during 1927, so that the average fare in the country now is 8.01 cents. This average is based upon fares in 272 American cities of more than 25,000 population. Buffalo, Syracuse and Albany went to ten cents last year; so did Norfolk, Va.; Fort Worth, Houston and San Antonio, Tex.; Jacksonville, Fla.; and Omaha. Requests for ten-cent fares are pending in many cities. Opponents of them declared that ten cents is more than the value of the service; that it is beyond the economic limit and will be burdensome to the public. The street-car companies reply by pointing to Boston, Cincinnati, Pittsburgh, and 112 other cities of more than 25,000 population, where the fare is ten cents and the public is apparently satisfied. They add that the dime of today is no more than the nickel of 1914, and that the street-car, ''formerly the exclusive means of transportation for all, is still a vitally necessary service for all, but exclusive for almost none.''

But the public service commissions, which alone can raise fares, have nothing to do in most States with traffic conditions which are tying up many street-car companies so tightly that the former short rider can walk faster than he can ride; nor anything to do with heavy tax burdens, relics of the days when City Councils and State Legislatures made street-car promoters pay through the nose for franchises. So the street-car men can go to no single point for general relief except to the public, which has the bad habit of becoming profoundly interested in the picture tabloids at the most inconvenient moments.

However, this same public's necessities will probably strengthen the faltering legs of the limping electric nag and eventually restore it to full vigor and efficiency. At all events, the railway men believe so. They are joined in this faith by a rapidly increasing band of traffic students. Every crossroad in America to-day has its traffic problem. In the big cities the street-car companies are openly calling upon the public to recognize the fact that, in the rush hours at least, the street-cars carry the most people while taking up the least amount of space. It is a generally accurate statement that from 70 to 80 per cent of the people in a big city are riding on street-cars or some other group transportation vehicle, mornings and evenings. They could not well ride in anything else; enough private vehicles to carry them all could not be contained within the average city's limits. So the future of the industry looks reasonably bright to those who take the view that in the big cities nothing else but street-cars will do the transportation work efficiently.

Their optimism finds encouragement in such cities as Chicago, where the Surface Lines, although in receivership, did a record business last year; in Philadelphia, where Mitten Management has corralled nearly everything that moves on wheels—taxis, buses, subways, elevated and street-cars—and hence almost makes its own traffic conditions; in Cincinnati, Cleveland, Pittsburgh and other towns, where agreements with the cities guarantee the investors in the railways a fixed return; and in the good business of the Capital Traction Company of Washington, the Denver Tramways, the Brooklyn City Railroad Company, and a few others with natural topographical advantages or strong lungs and great patience in ballyhoo.

19. Chronology and Notes on the Chicago Street Railway System *

The Chicago Surface Lines, an operating organization, is composed at the present time of four separate companies. These are the Chicago Railways Company, operating principally on the north and west sides of the city; the Chicago City Railway Company, operating the properties located on the south and west sides; the Calumet and South Chicago Railway Company, operating on the far south side; and the Southern Street

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* Adapted by Paul J. Raver from *Twentieth Annual Report of Board of Supervising Engineers, Chicago Traction,* for the fiscal year ended Jan. 31, 1927.

Railway Company, operating on the near west side of the city.

The last three companies, mentioned above, compose the group of properties known as the South Side Lines, of which the Chicago City Railway Company is the largest. The Chicago Railways Company, the north and west side lines, represents the consolidations, mergers and reorganizations of some twenty earlier traction companies, most of which were at one time or another under the control of Charles T. Yerkes and his associates.

The Chicago City Railway Company was the first company to secure an ordinance to operate a street-railway system in the City of Chicago. The rights contained in this ordinance, as passed August 16, 1858, were subsequently affirmed by an act of incorporation passed by the state legislature February 14, 1859. The Chicago City Railway Company and the North Chicago City Railway Company were incorporated under this act for a period of twenty-five years.

The next high light in Chicago Traction history came with the passage by the legislature of the Ninety-nine Year Act on February 6, 1865, over the veto of Governor Richard J. Oglesby. Five years later the new state constitution went into effect, which provided that ''no law shall be passed by the General Assembly granting the right to construct and operate street railroads within any city, town, or incorporated village, without acquiring the consent of the local authorities having control of the road or highway proposed to be occupied by said railroad.''[1] This was further amplified by ''The Horse and Dummy Act'' of 1874, which limited street-railroad franchises to twenty years. In 1875, the City of Chicago received a new charter which authorized the city to grant street-railroad franchises for a period not to exceed twenty years.

Litigation relative to the validity of the Ninety-nine Year Act provided the basis for some interesting financial history. On May 28, 1904, Judge Peter S. Grosscup of the Seventh United States Circuit Court sustained the validity of the Ninety-nine Year Act, and held that its effect was to extend to ninety-nine years the franchise rights of the companies from 1875, the date of adoption of the Cities and Villages Act which gave a new charter to the City of Chicago. On the basis of this decision and the opinion of other prominent legal minds of the country, a prominent eastern capitalist paid $200 per share for the stock of one of the large Chicago traction companies. However, in 1906, the Federal Supreme Court reversed the decision of the court below; and held that while the Ninety-nine Year Act extended the corporate life of the companies to ninety-nine years, its language was not sufficient to extend the duration of their rights in the streets of Chicago.[2]

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[1] Many attempts have been made by the cities of the state to gain "home rule" of their local utilities. It is to the point to note here that the above quoted provision of the Constitution of 1870 provides about the only vestige of home rule which the cities have thus far been able to obtain. The subject is still an issue. A special session of the legislature was called in the spring of 1928 to consider the proposal but nothing came of it.

The effect of this decision was to give the City of Chicago practical control of the situation, and opened the way for the final capitulation of the companies and acceptance of the 1907 franchise ordinances. With this final settlement and the establishment of the Board of Supervising Engineers, there began a program of reconstruction and extension which was unique in urban transportation history, and culminated in a traction system with splendid physical plant. In 1913, the Unification Ordinance was passed which provided for the unified operation of the four separate surface-line companies then existing by one operating company known as the Chicago Surface Lines. With through routing of cars a marked improvement in service resulted.

The Chicago Surface Lines faced an expiring franchise in 1927 with physical equipment at the peak of its development and condition. This fact can be credited in large measure to the foresight of the framers of the 1907 ordinances and to the judgment and ability of the engineers responsible for the standards and specifications evolved for physical plant and equipment. It should be noted, however, that the provision of the 1907 ordinances requiring the companies to set aside 8 per cent of the gross receipts for renewals and 6 per cent for maintenance stood in the way of any disposition which might otherwise have existed, of allowing the properties to depreciate during the final years of the franchise.

During the twenty-year period of operation the companies have paid over to the City of Chicago $39,398,357.90 as the city's share (55 per cent) of the divisible net receipts as well as $40,082,252.05 in direct taxes. The companies have been operating since February 1, 1927, on a month-to-month extension franchise. Where capital additions are required, the companies have been permitted to use money from the renewal and depreciation reserve. This expedient is, of course, in lieu of depreciation, and is only a temporary method of financing the additional capital requirements of the company. Such additions may later be capitalized by a proper reimbursement of the renewal and depreciation reserve.

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[2] *Twentieth Annual Report of Board of Supervising Engineers*, Chicago Traction.

The history of the various stages in the development of the elevated lines is no less interesting than that of the surface lines. It is felt, however, that the ultimate in modern mass-transportation in Chicago will not be reached until a final settlement is worked out on the basis of consolidation of the existing urban transportation agencies. Such a plan was presented to the electorate in 1925, but was defeated. Certain enabling legislation failed of passage at the 1927 session of the General Assembly. A special session in 1928 failed to provide a solution to the problem; and in the meantime the public awaits unified transportation, and the surface-line companies either face or are already in receivership.

Following is the chronology of certain events in the history of this transportation in Chicago:

February 14, 1859...	Chicago City Railway Company, and North Chicago City Railway Company incorporated.
February 21, 1861...	Chicago West Division Street Railway Company incorporated.
July 30, 1863......	This Company acquired rights from the Chicago City Railway Company to streets in the west division of the City for $300,000.
February 6, 1865....	Passage of Ninety-nine Year Act over the veto of Governor Richard J. Oglesby.
July 1, 1874........	Limit of twenty years fixed on future Railway grants.
July 30, 1883......	Compromise ordinance passed granting the three companies an extension of time upon all of their then existing lines in the City until July 30, 1903.
March, 1886........	Charles T. Yerkes and associates acquired control of the North Chicago City Railway Company and leased all its property to the North Chicago Street Railway Company, for a period of 999 years.

Chart 9

OUTLINE OF ORGANIZATION OF THE CHICAGO SURFACE LINES *

- Chicago Surface Lines
  - Chicago Railways Company
    - Chicago Union Traction Company
      - North Chicago Street Railroad Company
        - North Chicago City Railway Company
      - West Chicago Street Railroad Company
        - Chicago West Division Railway Company
        - Chicago Passenger Railway Company
          - Chicago Horse and Dummy Railway Company
        - West Chicago Street Railroad Tunnel Company
    - Chicago Consolidated Traction Company[a]
      - Jefferson Street Railway Company
      - Chicago Electric Transit Company
      - Chicago and Jefferson Urban Transit Company
      - Cicero and Proviso Street Railway Company
      - Evanston Electric Railway Company
      - North Chicago Electric Railway Company
      - North Side Electric Street Railway Company
      - Ogden Street Railway Company
      - Chicago North Shore Street Railway Company
        - Chicago and Evanston Electric Railway Company
    - Suburban Railroad Company
  - Chicago City Railway Company
    - Chicago and Southern Traction Company
      - Chicago Electric Traction Company
        - Englewood and Chicago Electric Street Railway Company
    - Chicago and Western Railway Company
  - Calumet and South Chicago Railway Company
    - Calumet Electric Street Railway Company
      - Chicago and Calumet Horse and Dummy Railway Company
    - South Chicago City Railway Company
      - Ewing Avenue Horse Railway Company
  - Southern Street Railway Company
    - Chicago General Railway Company
      - West and South Towns Street Railway Company
        - West and South Towns Street Railway Company

[a] Only properties inside the city limits were taken over.

* From Chicago Surface Lines *Year Book*, 1925-6.

June, 1886..........The North Chicago City Railway Company was authorized to equip all of its lines with cable power.

June, 1887..........Charles T. Yerkes and associates acquired control of the Chicago West Division Railway Company.

July 19, 1887.......West Chicago Street Railroad Company incorporated and property of the Chicago West Division Railway Company leased to it for 999 years.

February 12, 1888...The Chicago West Division Railway Company and the Chicago Passenger Railway Company, authorized by ordinance to install cable power. The main lines of all the companies were thus equipped during the succeeding five years.

1893 ....Chicago City Railway Company first overhead trolley installed. This was followed by trolleys installed by the West and North Side Companies.

June 1, 1899........Chicago Union Traction Company organized and took over under lease the North Chicago Street Railroad and West Chicago Street Railroad Companies.

December 1, 1899...Chicago Consolidated Traction Company[a] (incorporated Jan. 28, 1899, to take over the outlying North and West side companies), entered into a so-called operating agreement for fifty years with the Union Traction Company (organized June 1, 1899). The effect of this operating agreement, which dealt with both operating and financial relations between the two companies, was to give the Union Traction Company control of the Consolidated Traction Company. Instead of extending the lines of the North and West side systems, the Yerkes management organized independent companies to develop feed-lines, some of which extended beyond the City limits and a certain degree of community of financial interest existed between these companies and the North and West side

[a] NOTE—In the foreclosure and reorganization of the Union Traction Company's property in 1903, Chicago Consolidated Traction Company was not included

systems. The following were the seven companies thus combined into the Consolidated Traction Company:

Chicago Electric Transit
Chicago & Jefferson Urban
Cicero & Proviso
Evanston Electric
North Chicago Electric
North Side Electric
Ogden Street Railway Company

May 1902..........Bion J. Arnold, employed as expert engineer under ordinance passed by the City Council, authorizing the Mayor and City Comptroller to make a contract with him.

November 19, 1902..Mr. Arnold submitted his report as engineer to the Committee on Local Transportation of the City Council. In that report Mr. Arnold said that Chicago should be regarded as one city—not three, and that divisional lines should be obliterated as far as possible. He recommended the "One City—One Fare" idea, and that routes through the business district should be substituted for downtown terminals wherever possible. Two plans for a subway system were outlined in this report. Plan No. 1 provided for three north and south subways from Indiana Street on the north to 14th Street on the south, and two subways entering the business district from the west side and looping back at Clark Street. Plan No. 2, the one recommended, provided practically for the same north and south high-level subways in combination with three or more low-level subways for the west side passing under the north and south subways and reaching Michigan Avenue. A new, reorganized, unified and combined subway railway system was also planned, comprising all the street-railway lines within the city limits with all the new necessary and proper connections of all parts of the proposed system.

April 22, 1903......The Chicago Union Traction Company receiver appointed.

May 18, 1903.......The Mueller Law was passed by the Legislature, and signed by the Governor. It provided that every city in the State shall have the power to own, construct, purchase and operate street-railways within its corporate limits and to lease the same, or any part thereof, to any company incorporated under the laws of the State, for the purpose of operating street-cars for any period not longer than twenty years. The city is also authorized to incorporate in any grant it may make to any company to construct and operate street-railways, the right subsequently to take over all or any part of said street-railways or to permit a new grantee to do the same. In order to be legal in any city it must receive the majority vote of those voting thereon. No ordinance for a period longer than five years can go into effect until sixty days after its passage.

For the purpose of acquiring street-railways either by construction or purchase, or for the equipment of the railways, the city is authorized to issue its negotiable bonds for cost plus 10 per cent, and these bonds can be issued only after they have received a two-thirds (⅔) majority of those voting. Instead of doing as above the city may issue interest-bearing certificates, to be known as "Street-railway certificates," which shall be payable only out of the income of the property for which they were issued. The amount cannot exceed the cost plus 10 per cent. As security for payment the city may convey by trust deed or mortgage any part of the property and also the right to operate the same for twenty years after the foreclosure proceedings.

April 18, 1907......Supreme Court of Illinois held that the Mueller law was unconstitutional and held that the special street-railway certificates authorized would constitute a debt of the City of Chicago, notwithstanding the provisions of the statute and of the ordinance of January 18, 1906, that they should not be so considered, and held that the city

	could not then issue such certificates because it had then reached its constitutional limit of indebtedness. (See Lobdell *v.* City of Chicago, 227 Ill. 218.)
February 11, 1907	Traction settlement ordinances passed over Mayor's veto.
February 11, 1907	Acceptance of ordinance by the Chicago City Railway Company.
January 25, 1908	Foreclosure sale of the Chicago Union Traction Company's North and West side properties and purchase of same by the Chicago Railways Company.
January 28, 1908	Acceptance of ordinance by the Chicago Railways Company.
1910	The Chicago Railways Company took over the properties of the Consolidated Traction Company at the end of a lawsuit, and issued in payment $4,073,000 of 5 per cent bonds, called Purchase Money Bonds, and $2,200,000 of Adjustment Mortgage 4 per cent Bonds. These issues were both involved in the receivership of the Chicago Railways Company.
November 13, 1913	Ordinance passed for unified operation of Chicago Surface Lines with through routing and universal five-cent fare.
August 5, 1918	New ordinance reported to City Council. Later defeated by referendum vote.
August 8, 1919	Seven-cent fare fixed by Illinois Public Utilities Commission effective November 25, 1919.
December 27, 1919	Fare reduced to six cents by Illinois Public Utilities Commission.
November 5, 1920	Fare of eight cents approved in final order by Illinois Public Utilities Commission; $159,113,114—(the full City Purchase Price) named as the value of the properties of the Surface Lines and 7½ per cent fixed by the Commission as a fair return on the value of these properties.
November 23, 1921	Commission ordered fares reduced to five cents.
January 9, 1922	Temporary injunction issued by the Federal Court prevented this order from becoming effective.

20. Statistics of Operating Electric Railway Companies *

TABLE 7

	1922	1917	1912	1907	1902
Number of Companies	858	943	975	939	799
Number of Revenue Passengers	12,679,349,042	11,304,660,462	9,545,554,667	7,441,114,508	4,774,211,904
Total Income	$1,049,048,321	$ 730,108,040	$ 585,930,517	$ 429,744,254 [a]	$ 250,504,627 [a]
Total Expenses	$ 991,860,709	$ 673,657,110	$ 517,790,628	$ 389,403,968	$ 219,907,650
Total Assets	$5,831,206,424	$5,303,779,507	$4,619,480,307	$3,221,069,127	$2,067,634,007 [b]
Total Capitalization	$4,734,678,330	$4,626,788,077	$3,956,718,023	$2,811,876,374	$1,775,468,781
Number of Employees	300,523	294,826	282,461	221,429 [c]	140,769 [c]
Salaries and Wages	$ 445,680,135	$ 267,240,362	$ 200,890,939	$ 150,991,099	$ 88,210,165
Miles of Track	43,931.86	44,835.37	41,064.82	34,403.56	22,572.52
Number of Cars	99,255	102,603	94,016	83,641	66,784
Revenue Car Miles	2,124,523,362	2,139,801,530	1,921,620,074	1,617,731,300	1,144,430,466

[a] Exclusive of 6 companies in 1907 and 18 in 1902.
[b] Estimated.
[c] For 937 companies 1907 and 797 in 1902.

Bureau of the Census, *Census of Electrical Industries—1922 Electric Railways;* and *Street and Electric Railways 1912,* (Washington: U. S. Government Printing Office, 1925, 1914).

April 8, 1922.......Illinois Commerce Commission (successor of Illinois Public Utilities Commission) rescinded five-cent fare order and fixed rate at six cents effective May 1, 1922.

June 9, 1922........Temporary injunction issued by Federal Court restraining the enforcement of six-cent fare on condition that companies would after June 15, 1922, charge not to exceed seven cents cash fare.

February 27, 1925...Municipal Ownership Traction Ordinance passed by City Council.

April 7, 1925.......Municipal Ownership Ordinance defeated by referendum vote.

March 18, 1926.....Federal Master-in-Chancery Morrison approves seven-cent fare.

21. Chronology of the Street Railway Industry *

1834—Springfield and Boston: Thomas Davenport, a Vermont blacksmith, exhibited in those cities a toy electric motor moving on rails.

1838—Edinburgh: Robert Davidson conducted an experiment with a small electric locomotive on the Edinburgh-Glasgow Railroad.

1838—Jacobi experimented with an electric motor in Russia.

1840—Great Britain granted patent to Henry Pincus for a proposed system current to cars.

1847—United States granted a similar patent to Lilley and Colton.

1847—Dover, N. H.: Prof. Moses G. Farmer operated a two-passenger experimental electric car.

1851—(April 29)—Washington: Professor Page of Smithsonian Institution operated a 100-cell storage-battery motor car from Washington to Bladensburg, Md., the batteries being destroyed in the experiment.

1851—Boston: Thomas Hall devised a motor to take current conveyed by rail from a primary battery.

1855—European patents granted inventors of a system by which power was to be taken from an overhead wire.

1860—Boston: Hall exhibited a model of his invention at Mechanics' Fair.

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* Dwight Burroughs, "Chronology of Electric Railway Installations," *Aera*, XIV (1925), 932-3.

1875—Kalamazoo, Mich.: George Green operated a model electric car supplied with current from overhead wire.

1878—United States: Thomas A. Edison began work on an experimental electric car.

1879—Berlin, Germany: Siemens exhibited a model third-rail electric car at the Berlin Exhibition.

1879—Berlin: Halske exhibited experimental electric car.

1879-80—Brussels, Dusseldorf, Frankfort: Siemens and Halske exhibited experimental electric cars at expositions.

1880—Berlin: Egger exhibited a model car using current picked up from the running rails.

1880—Menlo Park, N. J.: Thomas A. Edison ran an experimental electric car at his laboratory, the running rails being used as conductors.

1880—Breuil, France: Experiments made with storage-battery car.

1881—Vincennes, France: Experiment made with storage battery car.

1881—(May) Lichterfelde, Germany (near Berlin): Siemens and Halske started operation for regular passenger-carrying purposes of an electric line a mile and a half long. Current was at first taken from the running rails, but later from overhead conductors; this was the first commercially operated electric railway in the world.

1881—Paris: An experimental electric railway shown at the Exposition.

1881—Boston: Field experimented with an electric car.

1881—Meran: Siemens built experimental road to show possibilities of electric traction for the St. Gothard Tunnel.

1881—Frankfort and Molding: Siemens built small experimental lines.

1883—Chicago: Electric Railways Company of the United States (Edison and Field interests) operated small electric locomotive at Railway Exhibition.

1883—Chicago: Charles J. Van Depoele exhibited electric car at Industrial Exposition, current being taken from wire by a trough.

1883—Greenville, N. J.: Leo Daft experiments with third-rail car at his factory.

1883—Saratoga & Mt. McGregor Railway: Leo Daft experiments with his third-rail car.

1883—Portrush (Ireland) Electric Railway: Siemens Brothers and Hopkinson equip third-rail for regular passenger service to the Giant's Causeway; this was the first commercially operated electric railway in Great Britain.

1883—Brighton, England: Short road installed, taking current from running rails.

1883—Kew Bridge, London: Storage-battery car tried.

1884—Cleveland: Bentley & Knight tried experimental car in yards of the Brush Electric Co.

1884—Kansas City: John C. Henry experimented with a system using two overhead conductors for current.

1884-85—Milwall, England: Battersea, England; Anthony Reckenzaum operated storage-battery cars experimentally.

1885—Toronto: Van Depoele operated train drawn by electric motor at Toronto Exposition.

1885—Boston: Daft installed exhibition lines at Mechanics' Fair.

1885—Point of Pines: Daft installed exhibition line.

1885—(August 10)—Baltimore: Leo Daft's third-rail Baltimore & Hempden line started regular passenger-carrying operation; this was the first commercially operated electric railway in America.

1885—Cleveland: August Bentley and Knight equipped a section of track of the East Cleveland Railway for electric operation, current being taken from a wire laid in a conduit between the running rails.

1885—Kansas City: Henry substituted rail return for one of the overhead conductors in his experiments.

1885—Denver: Prof. Sidney Short conducted experiments on a short stretch of track.

1885—Columbus, Ohio: Short continued experiments here.

1885—New York: Daft experimented for short time on Ninth Avenue Elevated Line.

1885—Toronto: Van Depoele had experimental exhibition electric car at Toronto Exhibition.

1885—(Autumn)—South Bend, Ind.: Van Depoele installed a commercial line here.

1885—Minneapolis (later than the above): Van Depoele installed a commercial line.

1885—Bessbrook-Newry: Hopkinson equipped short road.

1885—New York: Field tried out a third-rail locomotive on 34th Street branch of the Elevated.

1885—New York: Frank Sprague experimented with an electric motor car in the yards of the Durant Sugar Refinery on 24th Street.

1886—Windsor, Canada; Appleton, Wis.; Fort Huron, Mich.; Scranton, Pa.; Montgomery, Ala.: Van Depoele installed commercial lines in these cities.

1886—New York: Sprague experimented with an electric locomotive on 34th Street branch of the Elevated.

1886-7—St. Catharine's, Ontario; Lima, Ohio; Binghamton, N. Y.; Jamaica, N. Y.: Small lines equipped by Daft in these towns.

1887—Boston: Sprague operated an experimental overhead line at the East Boston Sugar Refinery.

1888—New York: Daft operated an electric motor hauling an 8-car train on the Ninth Avenue Elevated line.

1888—(February 2)—Richmond, Va.: Sprague opened an overhead trolley line; this was the first overhead commercially operated trolley line in America.

22. Development of Motor Transport *

The motor truck is an economic factor in transportation. Railroad congestion, priority orders, and other attendant conditions during the World War gave the motor truck its first real impetus in the United States and the freight-car shortage and other difficulties which the railroads faced in 1920 fostered the further development of the motor truck. The motor coach operation as it exists to-day has developed on a large scale only within the last three years.

Generally speaking, prior to 1914, transportation by motor vehicles was almost entirely individual in character, except where local cartage and cab companies maintained intra-city service. That individual transportation was of such importance, however, that it was sufficient to start the development of hard surface highways throughout the United States. Then the increasing efficiency of motor vehicles and the greater facility of transportation over hard surfaced roads than over unimproved highways led to experiments in organized inter-city and relatively long distance freight and passenger transportation.

During the period of extreme rail congestion, there began a rapid increase in the use of public highways by organized motor common carriers of both passengers and freight. At first, because of the inability of the railroads to handle all the traffic which was offered to them, motor truck operators were able to

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* Excerpts from pamphlet Report of Commission on Commerce and Marine, American Bankers Association, *Automotive Transportation and Railroads* (New York, 1927), Appendix, p. 53.

secure high rates and to make large profits. This resulted in a large number of undertakings by individuals to engage in long distance hauling. Many of these undertakings were conducted without much knowledge of costs and the financial mortality among motor truck operators was high. When business became light in 1921, and competition became more severe, many trucking organizations were forced out of business. With the revival of business in 1922, which was continued during 1923, existing trucking organizations expanded and new organizations came into existence. Since that time the number of trucks operated, both privately and in commercial service, has increased greatly.

The first motor busses operated were generally box-like bodies mounted on motor truck chasses. It was not until a special type of bus, called a motor coach, constructed especially for the comfortable and speedy carriage of passengers was introduced about 1923 that the real intensive development of the transportation of passengers over the highways began. Motor coach operation since then has been conducted on an ever-increasing scale.

The carriage of passengers and freight over the highways by commercial motor transportation companies is competitive to a degree which is difficult of ascertainment with the older forms of organized transportation, the railroads and the electric railways. A large proportion of the total freight and passenger business of the railroads is accorded some form of highway transportation before, after, or both before and after rail movement and all of this is properly auxiliary to the service maintained by both steam and electric railways. In large centers of population passenger travel by bus and by street-railway is at times competitive and at others complementary and coördinated. The movement of property within cities and towns, other than to or from stations, has only a remote relationship to rail service. Thus, a substantial proportion of the service rendered by motor vehicles is in no way competitive with that of rail-lines.

Part of the motor transportation service rendered between municipalities is non-competitive but just how large a part of the total such non-competitive traffic is has not been ascertained. It is certain, however, that much of the transportation rendered by organized motor truck and bus companies is directly competitive with railroad or electric railway operations or with both of them. . . .

From the standpoint of railroad securities the extent to which motor competition will affect the railroads in the future, that is, the extent to which motor transportation will replace rail trans-

TABLE 8

OPERATING INCOME AND RATE OF RETURN OF TWELVE SELECTED MOTOR FREIGHT LINES, STATE OF WASHINGTON, YEAR 1924.

CERTIFICATE NUMBER	INVESTMENT	REVENUES	EXPENSES	DEPRECIATION	OPERATING INCOME	RATE OF RETURN	DRIVERS' WAGES	OWNERS' OR MANAGERS' SALARIES
5	$ 18,609	$ 24,463	$ 19,303	$ 4,037	$4,811	25.8	$ 4,256	$ 3,000
13	9,150	11,387	6,719	2,013	2,367	25.9	1,074	2,150
57	51,880	58,415	54,849	7,809	2,826	5.4	12,751	7,200
96	198,737	158,153	148,392	17,696	8,526	4.3	40,066	16,858
119	48,970	46,830	40,438	5,382	4,819	9.8	13,192	4,810
247	96,386	93,006	84,353	11,938	5,130	5.3	28,568	5,750
248	36,610	37,067	38,816	8,382	2,778 [a]	7.6 [a]	11,465	5,128
276	16,774	23,100	18,419	2,748	3,974	23.7	5,036	600
309	18,076	29,535	24,256	2,404	5,003	27.6	11,074	600
348	11,395	11,697	10,319	1,300	1,214	10.6	822	2,916
353	28,787	43,805	40,277	3,268	2,431	8.4	7,539	10,500
369	11,397	12,449	10,677	2,019	1,405	12.3	5,337	.....

[a] Deficit.

TABLE 9

OPERATING INCOME AND RATE OF RETURN OF TWELVE SELECTED PASSENGER LINES, STATE OF WASHINGTON, YEAR 1924

CERTIFICATE NUMBER	INVESTMENT	REVENUE	EXPENSES	DEPRECIATION	OPERATING INCOME	RATE OF RETURN	DRIVERS' WAGES	OWNERS' OR MANAGERS' SALARIES
2	$160,316	$102,177	$ 93,026	$21,380	$ 5,460	3.4	$29,949	$ 4,800
3	48,805	47,935	37,069	7,279	9,629	19.7	10,502	1,488
16	127,147	171,450	141,083	23,305	22,826	17.9	19,185	17,513
27	102,278	79,924	58,094	10,893	19,844	19.4	12,132	7,388
28	178,878	83,455	86,383	8,533	9,305 [a]	5.2 [a]	18,661	8,569
99	48,730	28,781	27,473	3,288	452	.9	4,974	1,500
144	39,471	45,262	47,614	4,310	4,167 [a]	10.5	14,222	4,800
198	114,534	89,586	78,787	23,111	5,661	4.9	25,394	3,045
208	181,031	189,484	211,424	31,982	31,812 [a]	17.6 [a]	45,398	18,337
275	100,135	137,197	130,742	23,794	570	.6	20,231	12,652
304	14,025	8,267	4,696	3,500	109 [a]	.8 [a]	956	1,125
374	42,596	67,739	67,786	1,947	1,994 [a]	4.7 [a]	20,188	1,086

[a] Deficit.

portation, is important. If motor transportation is to replace rail transportation to a considerable extent so that railroad revenues become seriously impaired, undoubtedly the value of railroad securities will decline. On the other hand, if it is found that the economic field of motor transportation is supplementary to that of rail transportation, and if motor and rail transportation are so coördinated that each obtains the traffic which it is best fitted to handle, the value of rail securities should be enhanced, other things being equal. . . .

The following examples of rates charged by overland trucking companies are of interest. One company charged a door-to-door rate from Boston to New York 7½ cents per 100 pounds higher than the railroad station-to-station rate. On the other hand, one of the largest trucking companies in New England quoted a rate of 35 cents per 100 pounds for a haul of 108 miles. This rate is slightly more than one-half the rail rate. Door-to-door trucking rates of 25 cents per 100 pounds for distances of 45 and 50 miles in comparison with rail rates of 32 and 34 cents per 100 pounds are in effect in New England. These trucking rates are not remunerative but there always are a number of companies willing to perform trucking for these abnormally low rates.

It appears that only in a few of the larger companies are cost accounting procedures sound. Most of the smaller and many of the larger operators do not charge adequate depreciation on their equipment. This is evident from figures which have been studied. In some cases depreciation is based on a six-, eight- or ten-year life for trucks. Obviously this is not conservative, unless maintenance is of an exceedingly high standard which is not likely to be true in most cases.

One important feature in the matter of the highway transportation of freight is that per-mile costs do not decrease with increasing total distance as is the case on the railroads. A sufficiently definite study has not as yet been made to determine the sort of cost-curve which would represent motor highway operations but it does appear certain that the possibilities of profitable operations over long distances are much less than they are over short distances and the companies which report losses ordinarily are relatively long distance operators. An important element in the cost of long distance hauling is the necessity of garaging the truck and housing the crew on overnight stops away from the home terminal.

Local conditions so greatly affect the relationship of operating costs to operating revenues that it seems impossible to state at present any fixed maximum haul for profitable operation under rates made competitive with those of steam or electric lines. The most important of these local conditions is in the matter of balanced traffic. Freight carriers not only by highways but also by rail are faced with the high cost of moving of empty equipment. Where an unusually well-balanced traffic can be developed it appears possible to conduct a motor freight business for as much as 100 miles or perhaps more.

CHAPTER II

ORGANIZATION OF THE PUBLIC SERVICE INDUSTRIES

23. Introduction *

The study of industrial organization may be pursued along several lines. In this chapter are presented materials for the study of one or more aspects of the organization of each of the important public utility industries.

A description of the organization of the public service industries should give attention both to the industrial and to the business arrangements of these industries; it must look as well to the internal or administrative organization, whether for business or industrial purposes, as to the organization for external contacts and relationships. Industrial organization may be said to relate primarily to the relationships of things and persons in the form of a going plant while in business organization the emphasis is on the relationships among persons, their rights and obligations. The unit of principal concern in industrial organization is the plant or establishment, in business organization the ownership unit, now commonly in the public utility field, the corporation.

General Organization of the Electric Railway Industry

From the standpoint of business relationships the electric railway industry is organized into 1200 companies (1922) of which 858 were operating and 342 lessor. Of these 858 operating companies, 146 had an operating revenue of $1,000,000 or more, 204 had revenue from $250,000 to $1,000,000 while 508 or 42 per cent had revenue of less than $250,000 per year. The 146 large companies represent a major part of the industry, their revenue in 1922 having been 82 per cent of the total revenue of the industry.

In 1922, sixteen of these electric railway undertakings were municipally owned and one was state-owned (Bismarck, N. D.). Important among these municipally owned establishments were

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* Herbert B. Dorau, manuscript lecture notes, Northwestern University School of Commerce.

those in San Francisco, Detroit, and Seattle. The municipally owned portion of the electric railway industry is, however, of relatively little importance in total, representing only 1.81 per cent of the track mileage, 3.57 per cent of the revenue passengers, 7.3 per cent of the operating revenue, and 1.15 per cent of the value of road and equipment.

This industry is represented by approximately 44,000 miles of track of which 43,000 miles are surface lines, 602 miles elevated and 325 miles of subway and tunnel. From the standpoint of the character of service provided or nature of property and plant the industry can be further divided into city and suburban and interurban mileage. The interurban mileage in 1922 was 17,808 or 40.5 per cent of the total mileage. It is interesting also to note that approximately 40 per cent of the electric railway mileage of 1922 was on private right-of-way.

A considerable number of electric railway companies have always engaged in rendering other utility services. Thus in 1922 there were 124 companies giving commercial electric service. In 1907, there were 175 such instances reported. In 1922, moreover, 26 of the 124 companies also engaged in supplying gas for public use.

GENERAL ORGANIZATION OF THE ELECTRIC LIGHT AND POWER INDUSTRY

When the electric light and power industry is viewed from the standpoint of industrial organization it appears with its 6355 establishments to be a decentralized industry. This was more true in the past than now for to-day the industry is not at all homogeneous. We find on the one hand thousands of small establishments which in total do not represent 5 per cent of the industry and then a few hundred centralized establishments representing the large bulk of investment and production.

While the property and plant of the electric industry are of necessity even yet rather widely distributed, the ownership and control is not distributed in any such manner and is always becoming more centralized. This in addition to very commonly recognized economic urges is the natural result in an industry which is distinctly limited in its market area and so, in the economy of industrial integration, resorts to business integration in order to secure what measure of economy is available by that device.

The electric light and power industry like other utility industries is often combined in an industrial and more often a business way with other services. Table 10 sets forth the facts in this respect for the years 1917 and 1922. The average value of the composite plant is on the average almost twice that of the purely electric establishment, while about half of the total value of electric plant and equipment was represented by purely electric establishments, thus suggesting their far greater number and smaller average size.

From an industrial and technical standpoint a further division of the electric industry must be recognized. The steam electric and hydro-electric plants are so different in many important respects that even though often found together and in joint use they should be set apart for purposes of a general picture of the organization of the electric industry. Hydro-electric establishments of any size are comparatively few in number (Table 11). The investment in them was, however, in 1922 about 75 per cent of that in steam electric plants; revenue received was, however, less than half that of steam units, and the customers secured approximately one-third. The value of the hydro-electric plant

TABLE 10

CHARACTER OF SERVICE: ELECTRIC LIGHT AND POWER INDUSTRY *

	NO. OF ESTABLISHMENTS	
	1917	1922
Electric light and power and water	1,328	1,255
Electric light and power and gas	206	211
Electric light and power, gas and water	32	34
Electric light and power, gas and electric railway	14	26
Electric light and power and electric railway	11	14
Electric light and power, gas, water and electric railway	6	5
Electric light and power, water and electric railway	4	10
Electric light and power, and miscellaneous business, such as steam heating, manufacture of ice, mining, telephone service, etc	1,064	809

* *Composite or Single Service:* A "composite establishment" is one which carries on the generation and sale of electric current in connection with some other industry or industries. The enterprises most commonly associated with the electric light and power business are the production and distribution of gas, the distribution of water, and the operation of electric railways. In some cases such industrial activities as steam heating and the manufacture of ice are also found in connection with the operation of electric light and power plants. The above statement shows the number and character of the composite establishments reported for 1917 and 1922.

TABLE 11

Comparative Data: Steam and Hydro-Electric * Generating Establishments 1922 †

Steam Generating Units	
Number of plants	6,088
Value of plant and equipment	$ 2,554,070,853
Total revenue	757,324,941
Total expense [a]	601,123,558
Kilowatt-hours generated	21,591,489,713
Number of customers	9,404,184
Hydro-Electric Units	
Number of plants	267
Value of plant and equipment	$ 1,910,944,838
Total revenue	314,794,942
Total expense [a]	248,501,533
Kilowatt-hours generated	18,700,046,772
Number of customers	3,305,684

[a] Includes operating expenses, taxes, and charges for sinking funds and depreciation.

as would be expected was much larger than for the steam electric, averaging, in fact, about 15 times greater investment.

General Organization of the Manufactured Gas Industry

This public service industry is constituted of 919 establishments. Here again a few large establishments represent the principal portion of the industry; thus the 82 establishments which had revenues of $1,000,000 or more, were responsible for 75 per cent of the value of the product; and the 368 which in 1923 had revenue of $100,000 or more, were responsible for 95 per cent of the value of the product. Gas production not being so easily and economically carried on in small plants, and gas being transportable even less easily than electricity, gas service in the smaller communities is infrequent. Gas service like electric service is often rendered jointly by one industrial organization. Approximately one-third of the gas establishments also render electric service.

The business organization of the gas industry like that of the electric and other utility industries has been influenced by the trend toward consolidation and integration. Ownership integration begins where for some reason or another industrial combination must end. From an ownership standpoint the division of this industry into that part which is publicly and the part which is privately owned must be recognized. In 1925, out of the 919 gas establishments reported by the Bureau of the Census 52 were publicly owned. Thirty of these places had a population of 10,000 or less, and 15 had a population of 5000 or less. Since 1925 four of these 52 have been reported as sold. Although 5.65 per cent of the gas establishments were municipally owned these represented only 1.59 per cent of the value of the product and produced only 1.28 per cent of the gas manufactured.

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* Establishments with water power of 1000 horsepower or more, including some which reported both steam and other power.

† *Census of Electrical Industries, 1922 Central Electric Light and Power Stations* (Washington: U. S. Government Printing Office, 1925).

The Telephone Utility

The contrast between the telephone utility and the gas, electric and railway utilities is very marked in the matter of general industrial and business organization. Because the service which this industry renders is that of communication, of necessity the plant covers a large area. Twenty thousand central offices are connected by 37 million miles of wire (1922). In 1922, the industry was composed of 57,253 systems and lines and 26 of these were the Bell System. These 26 divisions of the Bell System represented 81 per cent of the investment and 83 per cent of the revenue. The organization of the telephone industry is thus characterized by the extent to which integration has gone. In further distinction to the electric and gas industries the telephone utility is entirely privately owned in the United States.

24. Nature of the Corporation *

The unit of management in railway enterprise is, without exception, the corporation. Indeed, in no other field is the corporation so characteristic as in this, the field of railway operations. Beginning as a small undertaking, the development of the railway corporation to its present great size may, in many instances, be clearly traced by a study of single properties. The corporation is variously defined. Perhaps the most widely known definition is that given by Mr. Chief Justice Marshall in the Dartmouth College case[1] in which he declared a corporation to be "an artificial being, invisible, intangible, and existing only in contemplation of law." A somewhat more explicit definition

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* Excerpts from Sidney L. Miller, *Railway Transportation* (Chicago: A. W. Shaw Co., 1925), Chap. XI, pp. 263-268.

[1] 4 Wheaton 518.

appears in Clark and Marshall.[2] "A corporation is a body, or artificial person, consisting of one or more individuals, or sometimes an individual and other corporation, created by law and invested by the law with certain legal capacities as the capacity of succession; the capacity to sue and be sued; to make contracts; to take, hold, and convey property; to commit torts and crimes; and to do other acts, however numerous its members may be, like a single individual." . . .

In the railway field, to an ever greater degree than in the industrial, the corporation has rendered an invaluable service both to the investor and to society. During the first half-century of railway development in the United States one of the outstanding characteristics of this enterprise was its speculative nature. Because of that fact it would have been exceedingly difficult to attract capital under any plan of organization except one which limited the liability of the investor to the amount which he initially put into the business. The corporation accomplished this limitation and therefore rendered particularly effective aid to pioneer construction. A second distinct advantage which the corporation enjoys in the railway field is that of continuity: because of the large investment and because of the very nature of the enterprise it is essential that the railway business unit have an uninterrupted life. Then, too, the nature of the investment in railways is of such character that easy transferability of interests is a factor of considerable importance. This ready transfer is made possible by the corporate form of organization with its accompanying issues of securities of various types. The large enterprise can be more efficiently managed, also, when organized as a corporation than it can be under any plan of management which necessitates the direct participation of a considerable number of interested parties in the current affairs of the business. And, finally, the corporation has proved its worth to railway undertakings in a peculiar degree because this form of organization has made available vast sums of capital which otherwise would not have been placed at the disposal of the railways. This has resulted not only from the fact that individuals will purchase shares of stocks or bonds in a corporation when they would refuse to participate as partners in the same enterprise, but also from the fact that, through the issuance of a number of different types of securities, the railway has been able to interest those who stress safety as well as those who demand a high return. So striking have been the advantages resulting from the use of the corporate form of organization that it is difficult to conceive of adequate railway development in the United States under private direction had this or a similar type of business unit not been available. And these advantages have steadily increased as the typical railway unit has developed from the small, locally financed undertaking to the gigantic enterprise which is characteristic of the railway field to-day.

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[2] William L. Clark and William L. Marshall, *Corporation Law* (Keefe-Davidson Co., 1901), Chap. I, p. 1.

The organization of the railway corporation for management differs little from that of large industrial or commercial enterprises. The stockholder, as enterpreneur, bears the major risks of the enterprise and possesses residual powers of management. Obviously, however, the active direction of the property must rest in the hands of men who are more cognizant of the needs of the business and who are able to give its problems a less divided attention than the average holders of shares. To that end a board of directors is selected by the stockholders and by that board are chosen, in turn, an executive committee to supervise, and a staff of officers to actively direct, the work of the corporation. . . . Although the stockholder in theory manages the property, in fact his control over those who wield authority is so remote as to make practice diverge widely from the intent of the corporate plan. Yet how escape divergence in the case of great corporations, whose stockholders are numbered by thousands and have among them not only the citizens of many states but the citizens of many lands?

Corporations are classified under three heads, public, private and quasi-public. . . .

The third type of corporation which is of particular interest to the student of railways is that commonly termed quasi-public. To cite Clark and Marshall again: "Some private corporations are organized for a purpose which is of a public nature or, rather, for a purpose which renders them particularly beneficial, if not necessary, to the public and are, for this reason, called quasi-public corporations; and because of their quasi-public nature they are sometimes given rights and privileges that are not granted to other corporations, as the right of eminent domain. For example, railroad companies engaged in the common carriage of passengers and goods are quasi-public corporations in this sense. . . . These corporations, though because of their objects they are called quasi-public are created for private gain and are mere private corporations just as a banking company or an insurance company is a mere private corporation."[3] In ownership, then, this third, or mixed, type of corporation is clearly private, but, in the responsibility which it bears to its patrons, it is public.

Upon this quasi-public character of the railway industry rests the entire structure of regulation which has developed gradually, until to-day the management of railway properties, even to many minor details, must be shared with public agencies. Out of this regulation, it may be added, have grown many complicated problems of administrative and financial nature, and also many exceedingly nice problems of law and jurisdiction. . . .

As has been indicated, the corporation is the sole type of business unit found in the railway field. This corporation lives because of the charter granted to it and possesses only such privileges and powers as are enumerated in that charter. As defined by Cleveland and Powell,[4] the charter "is a formal grant by the State to persons associated for the purposes of exercising powers and enjoying privileges which they could not otherwise enjoy." In this country with a dual system of government, charters have been granted by both the states and the Federal Government. However, so few charters have been granted to railways by the latter that, for practical purposes, we may regard the state as the source of the railway charter. These instruments were granted to railway corporations in early years by specific act of the legislature, just as they were to other corporate undertakings, but this method proved quite unsatisfactory. The consideration of charter applications consumed the time of legislative bodies which was needed for other matters, and the launching of a corporate enterprise was necessarily delayed if the legislature was not in session. Even more objectionable was this policy of granting special charters because of the corruption which accompanied the promotion of many projects. To escape the difficulties growing out of incorporation under specific act, a movement toward the enactment of general statutes governing incorporation gained such great headway that, during the past half century, few charters have been granted except under such statutes.

Beginning as small organizations in the early years, many modern railway corporations have become tremendously large and powerful entities. The financial magnitude of these properties can be best shown, perhaps, by presenting investment account and operating revenue totals. The Pennsylvania Railroad, including leased lines, with an investment account of about $1,800,000,000, has annual revenues which exceed $700,000,000, while the New York Central and leased lines have an indicated investment of about $1,300,000,000 and annual revenues in excess of $400,000,000. In the South the Southern Railway has an investment of slightly over one-half billion; enjoys annual revenues of about $180,000,000. In the Southwest, the Southern Pacific and the Atchison, Topeka and Santa Fe represent an investment of almost a billion dollars each, and each has annual revenues of approximately $200,000,000; to the north lie the Union Pacific, the Northern Pacific, and the Great Northern, each with an investment approaching three-quarters of a billion and annual revenues of approximately $120,000,000. . . .

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[3] *Corporation Law*, p. 49.

[4] Frederick A. Cleveland and Fred W. Powell, *Railroad Promotion and Capitalization in the United States* (New York: Longmans, Green and Co., 1909), Chap. X, p. 155.

Perhaps one of the outstanding tendencies evident throughout the course of railway development in America is that toward larger corporate units. In the early years of railway building, short lines connecting adjacent points and owned by unrelated corporations were typical; a southern railway, the Charleston and Hamburg, operating a total of but 137 miles of line, was at one time the longest railroad under a single management in the world! After a brief time, however, the movement toward unification began and, had it not been for the interference of public authority, the United States would undoubtedly have to-day a relatively small number of large railway systems. The following facts . . . indicate the extent to which the larger carriers now predominate, despite the obstacles erected by the government. In 1921, Class I roads, those with gross operating revenues in 1919 of $1,000,000 or more, numbered but 185 of the 848 active carriers of all classes, yet they operated 233,504 of the total 260,606[5] miles of railway in the United States, and during that year originated 940,182,560 tons of the total of 1,017,817,596 for all roads. In short, 21.8 per cent of the operating railway corporations controlled 89.6 per cent of the total mileage and originated 92.4 per cent of the total tonnage. Table 12 further indicates the importance of the Class I carriers, almost 40 per cent of which have incomes running above $10,000,000.

Evidence of concentration also appears in this: of the 185 Class I carriers tabulated above, the 28 highest "earners,"

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[5] Represents a duplication of mileage above 251,176 miles.

TABLE 12

CLASSIFICATION OF CLASS I RAILWAYS BY DISTRICTS, ACCORDING TO OPERATING REVENUES, FOR THE YEAR 1921

OPERATING REVENUE	TOTAL	EASTERN DISTRICT	SOUTHERN DISTRICT	WESTERN DISTRICT
Below 10 Million	103	39	20	44
10– 25 Million	34	14	8	12
25– 50 Million	17	5	1	11
50–100 Million	14	9	3	2
100–200 Million	14	3	3	8
Over 200 Million	3	2	..	1
Total No. Roads	185	72	35	78

constituting but 15 per cent of the total number, received in 1921 more than $3,850,000,000, or almost 70 per cent of the total operating revenues.

Not only has the tendency toward larger individual properties been conspicuous, but the movement toward concentration of active control has also been marked, and this has been true even of the period during which the legal consolidation of competitive properties has been barred. This movement has been facilitated by several developments. First, a wider distribution of stock has made possible the control of a given property through the possession of a smaller proportion of the outstanding shares. The small holder rarely takes an active interest in corporate management, his participation usually being limited to the contribution of his proxy to those already "in the saddle" to aid in perpetuating the existing management—unless, perchance, that management has committed the *faux pas* of failing to pay dividends either because of mismanagement or because of conservative direction of the property. Second, the increasing bond ratio has facilitated concentration of control. . . . The larger the proportion of bonds to the total outstanding securities, the easier does it become to control large and important properties by a relatively small outlay. The development of the holding company has assisted in attaining this same end: the inverted pyramid has made possible the control of enormous interests with a very modest investment, as is well illustrated in the case of the old Rock Island Company and the present Atlantic Coast Line Company. Then, too, it may be added that, although legal restrictions have been successful in preventing the physical identification of properties, such legal restrictions have not been uniformly effective in preventing an identity of interest. Where the sale or lease of a property is forbidden, a common group of stockholders has frequently made essential unity of action possible. Stockholdings of one railway in another may affect the desired identity of interest also and, in cases where such holdings run counter to the law, the interlocking directorate has been widely employed as a means of harmonizing the interests of large competitive properties. Finally, the type of stockholders has so changed during the past twenty-five years as to promote this movement toward concentration of control. Railway shares have become less speculative in character and have, therefore, been acquired by individuals and groups with other financial interests.

25. Origin of the Holding Company *

Obtaining capital for new enterprises and extensions and betterments of existing small central stations in the amounts desired for their extremely rapid growth has generally been difficult. From the outset local managements generally have found it necessary to go to the great financial centers where, in some cases, they and their projects were not sufficiently well known to obtain the capital needed on the most favorable terms. Manufacturers extended such aid as they could, and in so doing loaded their treasuries with securities that were not always readily marketable. The manufacturers, prior to 1890, sought ways in which to realize their holdings of securities taken in part payment for apparatus pending absorption of the operating companies' securities by the general public. The Thomson-Houston Electric Company on four occasions prior to 1890 resorted to the device of lumping together its holdings and depositing them with trustees who issued trust certificates backed by the securities of operating companies. These trust certificates were offered to stockholders of the Thomson-Houston Electric Company for cash. Gradually as the market developed for the underlying securities they were disposed of and the trust certificates redeemed in cash.

In 1890, the Thomson-Houston Electric Company, in order to render more effective assistance to the various local central-station companies which had become its licensees, organized the

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* Excerpt from Federal Trade Commission Report (Senate Document No. 46), *Supply of Electrical Equipment and Competitive Conditions* (Washington: United States Government Printing Office, 1928), Chap. XI, pp. 166-169.

United Electric Securities Company with offices in Boston, Mass. This company issued its preferred and common shares to the Thomson-Houston Electric Company in payment for operating company securities then in the company's treasury. The preferred shares were sold to the public, and the common remained in the possession of the Thomson-Houston Electric Company. The purpose of organizing the United Electric Securities Company was to assist in the financing of local lighting companies by purchasing all or some portion of the issues of bonds of those companies, for which there was at the time no general banking demand. These bonds were then deposited with a trust company, and against them the United Electric Securities Company issued its own collateral trust bonds for which there was a better market. The Electric Securities Company issued from time to time a total of thirty-nine separate series of collateral trust bonds, which were gradually retired by the sale or maturity of the bonds deposited as security therefor. On December 31, 1924, there were outstanding $3,622,000 of the total of $23,500,000 of bonds issued by the Electric Securities Company.

Similarly, the Edison interests, which subsequently were consolidated with the Thomson-Houston interests in 1892, organized the Edison Electric Lighting Company during the early eighties to act as a holding company for stocks of local lighting companies that had exchanged their stocks for licenses to operate under Edison patents.[1]

But the need of the electric-power industry for capital was greater than could be supplied by the manufacturers and a field for other financing companies was opened. Already in the gas industry companies organized to assist in the development of gas plants served as models for the development of early holding and financing companies in the electrical industry. Among the early holding and financing companies of the gas industry was the United Gas Improvement Company of Philadelphia, first incorporated in 1882, and reorganized under a special charter, granted to the Union Contract Company, giving extremely broad powers, "to construct, maintain, and manage any work and furnish all necessary material and labor and implements of any kind, to hold and own securities in any form, either as collateral or otherwise, and dispose of same." In 1902, this company owned or controlled 34 companies in the following states: Pennsylvania, Georgia, Iowa, New Hampshire, Massachusetts, Wisconsin, New Jersey, New York, Kansas, Missouri, Nebraska, Florida, South Dakota, Vermont, Mississippi and Connecticut.[2]

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[1] A. S. Dewing, *Financial Policy of Corporations* (New York: The Ronald Press Co., 1921), Vol. IV, Chap. VI, p. 163, note 26.

Although existence of successful gas holding companies explains in part their use as models in the formation of electric-holding companies, there were even stronger reasons for development of the two to be closely inter-related. Electricity from the outset invaded directly the lighting field previously occupied by gas. Those interested in one naturally would wish to control the other, if possible, in the territory served. Consequently, holding companies were formed to own, finance, construct, and operate both services. Such a company was the American Gas Company of Philadelphia, incorporated in 1892 under the New Jersey laws, to own, construct, and operate gas and electric light plants. In 1902, this company is reported to have owned eight gas, electric light, and traction properties in Illinois, Ohio and Maine.[3]

During the nineties the purposes of utility holding companies, as set out in their charters, were extended to cover not only gas and electric but other utility services, also; as in the case of the Light, Heat & Power Corporation, of Boston, incorporated under the laws of West Virginia in 1897, with a blanket charter giving it very broad powers to own and deal in securities and to build and operate public-utility plants of various kinds. The purposes of the company, as stated in Moody's Manual for 1902, were:[4]

> The manufacturing, selling, purchasing, and leasing of machinery and appliances and buildings and real estate; building, equipping, leasing, buying and selling water, light, power and heat, refrigerating plants and pipe lines, furnishing machinery and appliances to be used in connection with same, and maintaining and operating such plants; also the purchase and sale of securities of other corporations.

Likewise, the United Gas Improvement Company, originally organized, as stated above, for the development of gas companies, prior to 1902 held a controlling interest in no less than five operating subsidiaries engaged in both gas and electric services.[5] In later years, as the growth of the electric business surpassed that of gas, the ownership, financing, and operation of electric properties became the most important part of the business of the United Gas Improvement Company.

[2] Moody's, 1902, p. 735.

[3] *Ibid.*, p. 728.

[4] *Ibid.*, p. 825.

[5] *Ibid.*

An instance of the direct modeling of an electric power holding company after the successful United Gas Improvement Company is to be noted in the formation, in January, 1899, of the Electric Company of America, incorporated under the laws of New Jersey, with a charter authorizing it to manufacture, purchase, and sell coal. coke, gas, oil, water, electricity, light, heat, steam, and compressed air; and to own, acquire, construct, lease, and operate plants in connection therewith. This company was organized, with United Gas Improvement interests represented on its directorate, to take over properties owned by the Pennsylvania Manufacturing Light & Power Company outside of Philadelphia, and for acquiring other electric-light properties under a plan similar to that "in practice by the United Gas Improvement Company in acquiring gas properties."[6] Later, in 1899, the Philadelphia Electric Company was similarly organized, with United Gas Improvement Company interests on its directorate, to take over and consolidate electric holdings of the Pennsylvania Manufacturing Light & Power Company in the City of Philadelphia.[7] Other instances might be cited indicating the closeness of relationship between early gas and electric companies, but the foregoing brief citations are sufficient for the present purpose.

Early instances of electric public-utility companies organized by investment banking interests are the North American Company, organized in 1890, and the American Light & Traction Company, organized in 1901. Both were organized to take over investment holdings of existing companies, and both are still active corporations. The North American Company was organized to take over the assets of the Oregon and Transcontinental Company, and its purpose was the financing and control of street-railway and electric companies.[8] The American Light and Traction Company was a direct outgrowth of the investment banking business of Emerson McMillin & Company, of New York, organized in 1897. The McMillin interests centered largely at first in Milwaukee and St. Paul gas and electric companies. In 1899, it became a holding company, and in 1901 the American Light and Traction Company was formed to take over and operate its holdings.[9]

The building of light and power plants is a highly technical business. When the electric power industry was young, operating companies were small and local managements seldom had men with the necessary knowledge. This gave rise to firms of consulting and construction engineers, making a business of planning and constructing power plants and distribution systems on contract. But in the absence of general public demand for the securities of unknown local operating companies, these engineering firms, like manufacturers of machinery and equipment, soon found themselves burdened with securities taken in part payment for their engineering and construction services. To realize on their holdings the construction interests found it necessary, as the manufacturers had done, to form investment banking connections or to establish such agencies of their own. Excessive charges of investment bankers for placing securities and refusal to handle anything but small issues of short-term bonds, making refinancing necessary at intervals of a few years, placed an undue burden on the industry, and created a situation for the consulting engineer during the period from 1900 to 1915 that practically forced engineering firms to enter the investment banking business. An executive of a large financing, holding, engineering, and operating company (J. J. O'Brien, of Byllesby) briefly describes the situation by the statement: "Before we went into the banking business we were working for the banker." From the consulting, construction, and operating engineering interests, such important holding companies as the Byllesby, Barstow, White, and Stone & Webster interests have developed.

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[6] Moody's, 1902, pp. 786 and 906.

[7] *Ibid.*, pp. 868 and 906.

[8] *Ibid.*, p. 940.

[9] *Ibid.*, p. 1111.

26. How Public Utility Organizations Have Developed *

Where such a marvelous development has taken place and such huge investments are involved, the character of the organization through which this growth has been made possible is of first importance. . . . Public utility managers saw that with the large capital investment required as well as the necessity of a large volume of output in order to make the charges sufficiently attractive to the public, a complete monopoly in every locality was a necessity. On the other hand, it was obvious that two major problems confronted them. First, what was the most economical method by which the newly acquired properties could be financed; and secondly, what form of organization could be most economically administrated and operated. In the long run these economic conditions have always controlled whether we have willed or not. . . .

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* Adapted from W. E. Lagerquist, *Magazine of Wall Street*, XL (1927), 413.

From all that we have heard about the holding company in the past six years, one would suspect that a new form of organization had been created. Quite to the contrary. . . . The developments of the past few years have only been a further refinement and enlargement of the type of organization used in the beginning. . . .

The forerunner of the public utility holding company was the predecessor of the present United Gas Improvement Company, organized in 1882. At first the company followed the practice of leasing a number of gas companies in widely scattered communities, but two years later, however, the management began to secure control of the stock of these same companies. As the Pennsylvania law prohibited one corporation from holding the stock of another corporation, the stock was at first deposited with a trustee. The next stage of this development came with the purchase of the old Union Company, possessing extremely broad powers, and the changing of its name to the United Gas Improvement Company, which in turn acquired the assets of the old company of the same name by an exchange of stock in 1888. With the final organization of this latter company, the modern public utility company was under way.

Along with the predominant and growing use of the holding company during this period, which has likewise continued up to to-day, direct consolidations were also made. This probably was more true of street-railways than other utilities, partly due to the greater political chicanery of the times, which forced this type of merging. As a result many of the street-railway consolidations were greatly over-capitalized and as a class they never have been able to overcome this handicap. Even in a number of reorganizations which followed, the scaling of this excessive capitalization was not adequate. With the difficulties resulting from inadequate rates and bus competition during the war period all are so familiar that no statement seems necessary.

The next company to adopt the holding company was the North American Company, under the leadership of Henry Villard in 1890. Instead of acquiring a large number of single companies in different communities, The North American Company endeavored to secure control of all the utilities in a community and operate them under a single administration. This company started its first combination of this character in the City of Milwaukee in the year of its organization. It subsequently acquired properties with controlling interests in St. Louis and Cleveland, and minority interests in Detroit and Washington properties, etc. It, as the former company, has been highly successful from its origin. The exchange of stock, as well as the outright purchase of the stock of operating companies, has been maintained through the history of this company.

It was not long after these two types of holding companies had developed that a combination of them naturally developed and the combination form is the dominant type to-day. In these three forms we have what can strictly be called the representation of the true public utility holding company to-day.

The need of a new industry, particularly because of the technical character and the large capital investment required, is expert guidance and financial assistance. As a result, engineering and management service and financial organizations were created. At first these were developed as independent organizations, but many of them eventually have become the controlling holding company. In their original conception, these organizations cannot be called holding companies, as they often are, though they did play a very important part in the shaping up of the public utility organization.

One of the early difficulties which the electric light and power companies confronted and which was probably more responsible than any one thing for hastening the adoption of the holding company was the problem of marketing their securities. With an industry in the first stages of its development and the management of these companies unknown, they not only found difficulty in marketing their securities, but were compelled to pay very high prices for capital. In the effort to meet these difficulties the Thomson-Houston Electric Company, one of the predecessors of the General Electric Company, organized the United Electric Securities Company in 1890 to provide financing for the local operating companies. This form of organization, however, must in turn not be confused with the organization which has been more recently organized for the purpose of marketing the securities of the holding company and its subsidiaries.

In this development the United Electric Securities Company acquired the bonds of the local companies and deposited these bonds with a trustee and issued its own bonds. At a later date the same interests organized the Electric Bond and Share Company for making the common stock of local operating companies more attractive and at the same time enabling them to secure their necessary equipment. This organization, which was controlled by General Electric Company interests, however, has never owned more than a minority interest in the stock of the companies which it assisted in financing. Later it also provided expert engineering and operating services, which were rendered for a fee.

Quite apart from the large profits realized by the organizers of these early financing companies, these financing organizations were invaluable to the industry. It made cheaper service charges to the public long in advance of what might otherwise have been possible. In this day, when the worth of an important public utility stock is taken as a matter of course, we have lost sight of the great strength which this movement gave to the industry. As a matter of fact, it is doubtful whether we have ever appreciated its significance. The industry, with the help of these organizations, grew so rapidly that the early weakness of the position of many of the local operating companies was not realized by the general public. It was, indeed, fortunate that such a large number of the gas, electric lighting and power companies came under the influence of such organizations as the Electric Bond and Share Company and its affiliated interests. These companies were saved the embarrassment which befell many of the independent street-railway companies, but it is impossible to ever conjecture how much these organizations hastened the development of the utility industry.

As with all developments, there were a number of imitators who attempted to create similar organizations, but their failure was inevitable. Unsound financing, over-capitalization, inexperienced management, unprofitable companies and the like, all contributed to this outcome.

The service organizations which were organized about the same time as the holding companies, as a rule, soon created affiliated financial management organizations, which usually evolved into holding companies. The first of the service organizations in the electric power field was that of Stone & Webster. The firm began as designing engineers in 1889, but soon found it was necessary to enter the construction field. This was followed by the development of a supervisory and management organization and a financial advisory service. Stone & Webster, however, did not until recently make use of the holding company as a financial device to control their holdings. The transition of most organizations, entering either through management service or financial service organizations into holding companies, has usually been very much more rapid. The so-called service organizations have usually thus become adjunct organizations to the financial holding companies. Many of these organizations are now, in fact, a combination of holding and operating companies.

Among other important organizations which are known as finance or service companies controlling a large number of public utility properties are: H. M. Byllesby and Company, Hodenpyl-Hardy and Company, H. L. Doherty, W. S. Barstow Management Association, J. G. White and Company, A. E. Fitkin and Company. While these organizations have started with different approaches, the final shaping up of the control has been very much the same. While the degree of control, the character of service, and the charges for services to subsidiaries vary a good deal, it does not seem necessary for the purposes in hand to elaborate on these detail differences.

In addition to the so-called Service Group, just mentioned, there are other large unit groups which are a combination of operating and holding company units. These interests either have a large number of adjacent properties which have been or are gradually being interconnected. Others control a number of widely scattered properties. Into this class fall the North American interests already mentioned and such companies as the Insull interests, Public Service Company of New Jersey, the Duke Power Company, the Pacific Gas & Electric, etc.

A few companies, because of the size of the communities which they serve, have been able to economically operate as an independent unit without the overhead proving unwieldy. Among this group would be placed the New York Edison, the Brooklyn Edison, the Detroit Edison and the Southern California Edison.

A number of very much smaller and weaker holding groups have been organized since the World War and are acquiring control of a number of small and widely scattered properties. With the turn of the tide in favor of public utilities, the opportunity was made possible for promoters to create new organizations, for it has been a very easy affair to sell almost any form of bond issues in the last five years. Little can be said about some of these newer combinations because of the limited information concerning them. The larger numbers of these will undoubtedly be sooner or later absorbed by the larger existing groups.

By 1905 the various types of public utility holding companies had been fairly well-established and maintained a fairly steady growth. Public utility commissions and regulatory statutes, beginning with New York in 1907, were brought into existence in nearly all of the states within the next five years and undoubtedly tended to retard mergers and consolidations. The climax of this first era of rapid expansion culminated in 1911, along with the general decline of business that continued up to 1915. However, a number of new small power projects were built after 1910. Some of these were not well-placed as to the markets, others were expensively constructed and, as a consequence, had a top-heavy capitalization structure. The greater number of them had discounted the development of their markets too far in advance. Undoubtedly, but for the abnormal war demand for power a greater number of these companies would have gone into receivership than actually did.

27. A Holding Company and Subsidiaries *

Chart 10

THE NORTH AMERICAN COMPANY OWNS AND CONTROLS THE FOLLOWING AS OF JUNE 30, 1927:

(1) North American Edison Company, controlling
  The Cleveland Electric Illuminating Co. (Cleveland, O.), controlling
    The Power and Light Building Company (Ohio)
  Union Electric Light and Power Company (St. Louis, Mo.), controlling
    The Light and Development Company of St. Louis
    Mississippi River Power Company (Keokuk, Ia.), controlling
      Missouri Transmission Company (Keokuk, Ia.)
    Cupples Station Light, Heat & Power Company (St. Louis, Mo.)
    St. Charles Electric Light & Power Company (St. Charles, Mo.)
    Union Colliery Company (Duquoin, Ill.), controlling
      Dowell Electric Company (Illinois)
    Central Mississippi Valley Electric Properties, controlling
      Keokuk Electric Company (Keokuk, Ia.)
      Fort Madison Electric Company (Ft. Madison, Ia.)
      Dallas City Light Company (Dallas City, Ill.)
  The Milwaukee Electric Railway and Light Company, controlling
    Milwaukee Northern Railway Company (Milwaukee, Sheboygan, Wis.)
    Badger Public Service Company (Elkhart, Wis.)
  Wisconsin Gas and Electric Company (Racine, Kenosha, Watertown, Wis.)
  Wisconsin Electric Power Company (Milwaukee, Wis.)
  Wisconsin Michigan Power Company (Appleton, Wis.), controlling
    Inter City Bus Company (Wisconsin)

(2) Union Electric Light & Power Company of Illinois (East St. Louis, Ill.)

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* Courtesy, North American Company, Statistical Department.

(3) Western Power Corporation, controlling
  - Great Western Power Company of California (San Francisco, Cal.), controlling
    - California Electric Generating Company (Oakland, Cal.)
    - Western Canal Company (California)
    - Napa Valley Electric Company (Napa, Cal.)
  - San Joaquin Light & Power Corporation (Fresno, Cal.), controlling
    - Bakersfield & Kern Electric Railway Company (Bakersfield, Kern, Cal.)
    - Valley Electrical Supply Company (Cal.)
  - Midland Counties Public Service Corporation (San Luis Obispo, Cal.)

(4) The St. Louis County Gas Company (Webster Groves, Mo.)

(5) The East St. Louis and Suburban Company (East St. Louis, Ill.), controlling
  - East St. Louis Light & Power Company (Ill.)
  - East St. Louis Railway Company (Ill.)
  - East St. Louis & Suburban Railway Company (Ill.), controlling
    - Blue Goose Motor Coach Company (Ill.)
    - Red Line Motor Company (Ill.)
  - St. Louis & Belleville Electric Railway Company (Ill.)
  - St. Louis & East St. Louis Electric Railway Company (Ill.)

(6) Alton Gas Company (Ill.)

(7) Alton Light & Power Company (Ill.)

(8) Alton Railway Company (Ill.)

(9) St. Louis & Alton Railway Company (Ill.)

(10) West Kentucky Coal Company (Sturgis, Ky.), controlling
  - St. Bernard Coal Company (Earlington, Ky.)
  - West Kentucky Property Company (Ky.)
  - West Kentucky Coal Company (Del.)

(11) Wired Radio, Inc. (Del.)

(12) Sixty Broadway Building Corporation (N. Y.)

(13) Edison Securities Corporation (N. Y.)

(14) North American Utility Securities Corporation (Md.)

The North American Company also has substantial, but not controlling, interest in the Detroit Edison Company (Detroit, Mich.), Washington Railway & Electric Company (Washington, D. C.), and North American Light & Power Company (Chicago, Ill.)

29. Distribution of Control *

TABLE 13

ELECTRIC POWER INDUSTRY GROUPS, 1924

	PERCENTAGE TO TOTAL IN UNITED STATES			
	Energy Generated	Installed Capacity	No. of Customers	Revenue
General Electric Interests	12.30	12.40	11.21	13.20
Service Groups				
Stone & Webster	2.28	2.16	2.21	2.14
Byllesby	5.02	5.30	5.34	5.23
Hodenpyl-Hardy	2.76	2.72	2.49	2.74
Doherty	2.24	2.45	2.28	2.50
Others	7.24	10.72	10.41	10.10
Large Combinations				
North American Co.	7.28	6.39	5.58	6.06
Insull Interests	8.74	8.65	11.52	9.62
Public Service Corporation of New Jersey	2.16	2.04	....	3.04
Others	3.92	3.84	3.12	2.22
Extensive Unit Developments				
Pacific Gas & Electric Co.	3.26	2.71	2.68	2.31
Montana Power Co.	2.24	1.17	.32	.63
Duke Power Co.	2.57	1.31	.03	.96
Other Unit Developments	1.70	1.30	.33	.62
Other Holding Company Groups	13.70	13.00	12.90	14.80
Independent Companies				
New York Edison & United Electric Light and Power	3.96	4.01	4.02	5.15
Southern California Edison Co.	2.81	2.50	2.06	1.78
Detroit Edison Co.	2.80	2.56	2.89	2.70
Philadelphia Electric Co.	2.51	2.39	2.56	2.54
Brooklyn Edison Co.	1.20	1.70	3.52	2.20
Others	1.80	2.10	1.30	2.02
All other Independents	4.85	5.28	7.50	6.87
Municipally owned	2.24	3.00	5.34	....
Totals [a]	99.58	99.70	99.61	99.43

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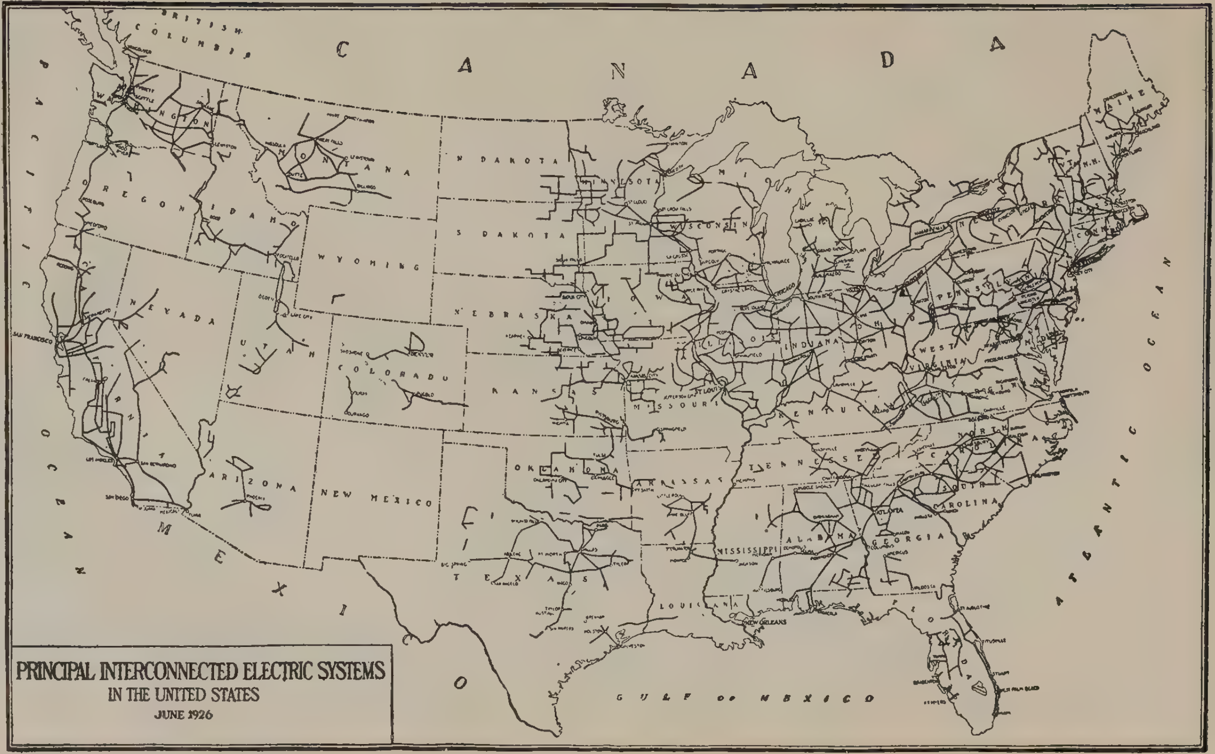
* As of December 31, 1924—computed from figures in Federal Trade Commission Report (Senate Document No. 213) *Control of Power Companies* (Washington: United States Government Printing Office, 1927), Chap. III, pp. 36-37.

[a] Note: Percentages do not total 100 per cent as several almost negligible groups were omitted.

30. Interconnected Electric Systems *

Chart 12


PRINCIPAL INTERCONNECTED ELECTRIC SYSTEMS
IN THE UNITED STATES
JUNE 1926
CANADA
BRITISH COLUMBIA
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
MEXICO
WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
N DAKOTA
S DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
N.H.
VT.
MASS
CONN
SAN FRANCISCO
ST LOUIS
CHICAGO
NEW ORLEANS
ATLANTA
DENVER

* From *Bankers' Monthly*, October, 1926, p. 7.

32. The Holding Company *

From a purely technical standpoint, the term "holding company" is applied to a corporation chartered under the laws of one of our states with broad powers which enable it, among other powers, to acquire and hold securities of other companies and to issue securities of its own. The holding company has developed during the past fifteen years principally in the public utility field, and to-day the term is usually understood to apply to those companies which own or control several utilities, either contiguous to each other or located in various sections of the country. This discussion will be confined to public utility holding companies.

Usually the aim is to acquire of these operating companies all or a controlling majority of the outstanding stock, more or less of the bonds and other general securities, and almost continuously to hold, as security, notes for advances made in cash to meet current operating and construction needs. These various securities form the asset basis for the issuance by the holding company of its own securities. Generally considered it is not a direct operating company, but oftentimes owns in fee the utility property furnishing service to the public.

The closest analogy which we have to the holding company from the financial standpoint is the so-called "investment trust," which has been an established and important factor in the financial and investment life of Great Britain for many years.

Mr. Leland Rex Robinson, American Trade Commissioner in London, made a report in which he refers to investment trusts as follows:

> (1) They raise capital, with few exceptions, by issuing ordinary and preferred stock, and they exercise their borrowing power by selling debentures.
>
> (2) Their funds thus obtained are invested in a wide variety of offerings, distributing the risk over many industries, countries or types of issue.
>
> (3) They appeal to the cautious investor by offering both proprietary and creditor stocks of reasonable denomination, and by protecting his interest, whether he holds shares or bonds, by a conservative managing of the capital account.

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* John H. Pardee, "The Holding Company in Public Utilities: Its Advantages and Dangers," *Proceedings of the Academy of Political Science*, XI (1924-1926), 699-707.

In the past there was much opposition to combinations of endeavor, capital and property, such as "trusts," "mergers," "combines," et cetera. Trusts, so-called, were resisted because they were supposed to be organized for the purpose of such complete control of manufacture and sale of commodities that prices to the consumers could be raised or lowered at the will of the trust. Such reasons are of no force as applied to holding companies, as rates to the consuming public are regulated by Public Service Commissions in almost every state.

The holding company is not a vicious "combine," it is not a vicious "merger" and it is not a "trust," and to-day industry everywhere has turned toward consolidation and economy in operation.

The investment trust is a passive holder of securities and functions only in acquiring or parting with such securities, receiving interest or dividends thereon and disbursing its income to its own security holders. The holding company functions actively and in a broad variety of ways, it plans the policies and finances of its subsidiary companies and acts as the guardian, protector and manager of the properties in its charge. It is a *managing owner company.*

The gathering together in effective control of a number of diversified public utilities brings about a community of interest among them and a concentration of responsibility. This enlarged responsibility makes the field attractive to a class of executives who might not be otherwise attracted and whose ability could not be obtained by a single utility. The joining of resources makes possible the assembling of technical staffs consisting of engineers, economists, chemists and others with scientific training, who being enabled to work with larger resources and with a fuller field of experimentation, can make and have made in the last ten years alone, contributions to the advancement of the electrical sciences which have been of the utmost benefit to the industry. Coupled with this economic assembling of a more skilled personnel are the advantages arising from assembled purchasing power and particularly from the improved opportunity and ability to finance desirable and needful extensions of plant and service.

The use of electricity in our modern life has become so convenient, so desirable and so free from interference, and the cost has been so reduced, that what was a luxury twenty years ago is a necessity to-day. Electricity is probably the only commodity which is being furnished at a lower cost than prior to the

World War. Bituminous coal is approximately 60 per cent higher than in 1913. Anthracite coal is 95 per cent more; and meats, at retail, are from 74 per cent to 102 per cent more. Railroad rates are higher, and the same comment might be made regarding almost any commodity or service selected. The economic causes which have brought about these increases in prices have had their effect upon the electrical industry to as great an extent as they have affected other lines of endeavor. But, in spite of the fact that its costs of operation and construction have risen equally with those of other industries, the electrical industry sells its vastly improved service in 1925 at an average cost 10 per cent lower than it did in 1913, and I desire to emphasize that it is in these twelve years that the holding company idea has had its greatest impetus.

Electrical service, which until a few years ago was one of the claimed advantages of urban life, now reaches its vast network out to the farm and the village, contributing largely to the convenience and contentment of our rural and semi-rural population. Transmission lines extending distances unheard of five years ago now link important sources of energy with large distribution centers and, in passing from one point to another, bring to thousands a service which could not be brought to them otherwise. Practically all cities, towns and villages in the United States of 5000 population and over, and 14,000 communities of less than 2500 population, now have electrical service.

It might be claimed that these beneficial results would have been secured in any event, and without the influence of the holding company. The electrical industry is peculiar in that it cannot expand or develop to any appreciable extent, as other industries have the opportunity to do, through the reinvestment of surplus earnings. There are not and cannot be any large surplus earnings over and above proper returns in the electrical industry, for the reason that regulation throughout the United States confines its earnings to what has been defined as the fair return upon the fair value of the property. The result is that substantially all capital for extensions and improvements in the electrical field must be *new* capital furnished by present or additional investors. The growth and extension of electrical service, the contributions made to the science, the adoption of new ideas and the discarding of old theories have necessitated vision, skilled management and the investment of tremendous sums. The holding company has been the agency through which these sums of skill, energy and capital have been marshaled. It is only the community of interest and the concentration of responsibility and control which have made it possible. An individual utility, for instance, could not, under any except the most extraordinary circumstances, search out and develop a power source as much as one hundred miles away. The difficulties in the way of single utilities functioning separately and accomplishing these results are almost insuperable. Given a community of interest, given a wide diversity of uses for the energy, given an accumulation of resources and ability to finance, given an able technical personnel, given an able administration along national and state rather than local lines, these things become possible. Individual small plant operation is uneconomical and expensive and the scores of municipally-owned plants all over the United States now being sold or leased to holding companies are evidence of this.

Every substantial holding company with which I am familiar is officered and staffed by trained men with long years of experience in the practical phases of the public utility business, and grouped about them are other men practically trained in engineering, finance, accounting, law, economics, chemistry, and other branches as they relate and directly apply to public utility operation. These men exercise constant and direct supervision of a high order over the operations of the local utilities, tendering to the local managers and superintendents all the resources of a highly skilled organization which would not be available to a local company except at a prohibitive cost.

As I have stated earlier, the holding company issues its securities to the general investing public and, through the diversity of operating conditions which it is possible to get when a large number of operating properties are joined in a common interest, creates an over-all credit standing and creates consistent income-producing securities.

In addition, it aids materially in the promotion of pleasant and cordial relations between the utility and the public by inviting consumers to participate by becoming partners in the enterprise through the acquisition of its securities. These securities depend not only upon the earnings of the individual isolated property but upon the earnings of a large number of properties having diversified activities and operating under diversified economic conditions, thereby assuring under the law of averages a continuous and stable income return.

This ownership by consumers of large amounts of its securities is one of the soundest and most stable features of the holding company plan.

As Mr. Robinson said further in his report:

> In the process of . . . investment there are continually arising problems with which the individual stockholder cannot cope. . . . In times of political disturbance or trade depression the power of the trust companies in defending the interests of their shareholders is immeasurably greater than any action taken by isolated groups.
>
> The limited savings . . . of investors are judiciously distributed among many securities. . . . The law of averages keeps fairly steady the capital account of any well managed trust. Thus, an uninitiated investor . . . is able to put his eggs in more than one basket even though, strictly speaking, he has only one egg.

The electrical industry in the United States has an investment of nearly $7,000,000,000. Its gross annual revenue is approximately $1,500,000,000. It serves about sixty billion kilowatt-hours of electrical energy annually to approximately sixteen million customers, which means that the benefits of electrical service are available to approximately eighty millions of our population. It is estimated that in the next ten years the electrical industry will require not less than $1,000,000,000 of new capital annually and the main burden of procuring this will, of necessity, fall upon the holding company. This new capital cannot be raised piecemeal but must be provided by the holding companies which are capable of doing financing *en bloc.* This new capital will be devoted to further extending the service into territory where no service is presently given, and to serve more intensively the territory which is now occupied. Beyond this, the standard of living is constantly rising and new appliances, designed for the convenience and comfort of the householder, are being produced and improved. Instances of this are found in the use of electricity for cooking and for refrigeration. Because so much service remains to be given and because such vast capital is required to be raised within the next decade, the holding company, with its ability to manage and finance, must play a most important part in bringing this service to the people of our nation.

A criticism of the holding company which may be encountered is that with the centralization of power, authority has been taken away from the local utility and that it has lost the responsiveness to the local public need which existed previously. If this means responsiveness to the exigencies of local politics and local politicians, the criticism is warranted because in my opinion the accumulation of strength, which has resulted from the growth of the holding company, has had the very wholesome effect of taking local utilities out of politics. If, however, this criticism implies that the activities and functions of the local management are curtailed or that reasonable suggestions for the improvement of service in the civic good are slighted or ignored, it is wholly unwarranted. I cannot emphasize too strongly that never in the days of wholly individual and isolated operations was there as much response to the local public convenience and necessity as there is to-day. And it is only natural that it should be.

The holding company cannot be successful unless its subsidiaries are. Its subsidiaries can only be successful so long as their business rests upon the firm foundation of public confidence which in turn can only be built upon good service. The local utility of today, which draws strength out of the grouping process, can give service of a type, in a quantity and at a price which it could not give if standing alone. When improvements must be made, not only can it command the necessary funds by receiving advances from its holding company, but it pays on the average a lower rate for them. If alone, such utility could not, in many cases, obtain the money at all even at a high rate of interest. Beyond this is the fact that most large holding companies look to the consumers of service on the individual properties to assist in the financing of the properties, by inviting them to purchase securities in the holding company. Is it conceivable that the holding-company idea would contemplate affronting the very people from whom it derived its resources and whom it was inviting to become its partners? And, even aside from this, is it possible in the present state of our regulatory law that a holding-company management could override the wishes of the people of a state as expressed in the various Public Service Commission laws throughout the country? They are regulated at the source.

Another criticism rests upon the possibility that the holding company may sell to the investing public inflated securities. The term "watered stocks" is sometimes used. Doubtless securities of this character have been issued on occasion, just as securities of this character have been issued in every other form of business venture. I urge, however, with the utmost vigor, that the results which have been obtained by way of expansion and improvement in methods of furnishing a valuable and necessary public service could not have been achieved under the sponsorship of corporate organizations whose financial structures were unsound. Money is a commodity which must be purchased in the money markets in competition with the money requirements of all other forms of industry. And the holding companies have successfully met this competition on the basic strength of the securities they have been able to offer. As a practical matter, securities are subjected to the searching scrutiny, investigation and judgment of bankers who are most careful in selling to their clients only such securities as may prove sound, thus preserving their own prestige. In view of the fact that the holding company must constantly be in the market for new capital with which to enlarge and develop the service of its subsidiaries, and in view of the further fact that in the main its capital must flow back to it through investment sources from the public which it serves, it is inconceivable that inflation or so-called ''watered securities'' should enter into the capital structure of our responsible holding companies. Speculation may occur and should be deprecated, but it is no proof that the financial structure of the company is unsound. While the holding company is, to a considerable extent, a financial company, yet woven into it is the great essential—management. A failure of any company, industrial enterprise, bank or loan association, usually comes from poor management but that does not prove an unsound plan.

The soundest capital structure for a holding company, in my opinion, is one in which no new obligations of the subsidiary or operating companies are issued except on most advantageous terms, and refunding is done through the holding company so that the credit of the operating companies will be increased and the earnings of the entire group will increasingly be brought as close to the securities of the holding company as it is possible to bring them. Create this situation and having, as you always will have, skillful management and the diversity of earnings sources, you will then have securities more stable, with better markets, better investment values, and more consistent earnings than the average operating property can ever offer to an investing public.

It has been suggested that holding companies be placed under the jurisdiction of the Public Service Commissions. This is not proper, as the holding company is simply a stockholder or the owner of securities of operating utilities, the same as any individual; however, the operating utilities, and their securities are under the control of the commissions as they should be, for the protection of both the public and the owners of utilities. Under intelligent state regulation, neither watered capital nor speculation can affect the rates paid by consumers. Another complete answer is the enquiry as to which state should have jurisdiction over a holding company having interests in several states: certainly all could not control. Financing in advantageous markets and at low rates often has to be done promptly, and the usual months of delay of consideration by commissions would nullify any advantages and might produce material losses to the consuming public.

Federal regulation might be invoked, but federal regulation has not been the success which its first and most ardent admirers claimed for it. In fact, it is safe to say that the present-day tendency is away from rather than toward extension of governmental interest in business. As bearing on this question, I beg to quote Hon. Herbert Hoover in an address made to the National Association of Railroad and Utilities Commissioners only two weeks ago:

> A good deal of apprehension in the public mind has arisen from the era of railway exploitation of a generation ago, for fear that this may be repeated in this transformation of the electrical industry.
>
> All of this ignores the fact that regulation of public utilities by our states has grown up since that particular horse was stolen but the barn door has been shut on our electrical utilities by regulation from the day they were born.
>
> It is difficult to conceive of a situation which, so far as public interest goes, could not be controlled in this simple and effective manner (state regulation). It needs no new machinery, no complicated interstate compacts between each of forty-eight states, and its numerous neighbors each requiring sanctions by Congress. If, in the passage of time and the accumulation of experience, the unexpected, either economic, or legal, should happen and we find an occupied field requiring regulation, it will be time enough then to talk of federal control. No such condition exists to-day or is apparent in the future.

The holding company is the vehicle for unification and finance in the public utility field and it is the vehicle for effective management which, in the broad sense, is the key to success in business. The far-flung and rapidly increasing extent of activity in the electrical utility field, sponsored and fostered as it has been by the holding company, is the most complete and convincing proof obtainable that the holding company idea is sound, justified, and has a definite and established place in our economic and financial structure. The holding company idea has proved itself. Millions of users of electricity owe their service to its application. A great work lies ahead of it and it should be permitted to proceed with this great work in the freest manner. It should have to the utmost the generous and full expression of public confidence which it so well deserves.

33. Administrative Methods of the Second Largest Gas and Electric Company in the Country *

The Pacific Gas and Electric Company's operations extend over thirty-six counties of Northern-Central California, containing within its territorial boundaries a population approaching 1,800,000, or over one-half of the population of the State. Pacific Gas and Electric Company is by far the largest utility of its kind in the West, and is second largest in the entire United States. It was incorporated in 1905, through a merger of the California Gas and Electric Corporation with the San Francisco Gas and Electric Company. In 1919 it purchased the properties of the Northern California Power Company and in 1920 leased the properties of the Sierra and San Francisco Power Company.

In addition to its boards of directors and executive officers the company's administrative organization includes a group of six management officers, each invested with the title and powers of vice-president, among whom, under the supervision of the general manager, various departmental responsibilities are distributed as follows:

The vice-president in charge of electrical construction and operation directs the construction and reconstruction, maintenance and operation of all the company's hydro-electric and steam-electric generating plants, transmission and distribution lines and sub-stations connected therewith, the street-railway system at Sacramento, California, and all water systems owned and operated by the company.

The vice-president in charge of engineering directs all investigations into the company's power development projects and also the advance studies and designs for all construction work to be done, equipment to be installed and apparatus to be used in connection therewith.

The vice-president and executive engineer directs studies of economic factors affecting the company's development; collects

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* Excerpts from article by Charles W. Geiger, *Industrial Management*, LXXII (Sept. 1926), 196-199.

all statistical data relative to the physical properties of the company; correlates the physical and financial operations; and prepares valuation and rate schedules.

The vice-president in charge of gas construction and operation directs the construction, reconstruction, maintenance and operation of all the company's gas-generating plants and distribution systems.

The vice-president in charge of sales promotes and directs all sales of gas and electric energy and appliances.

The vice-president in charge of public relations and service has charge of all publicity and personnel work; is in direct control of all matters affecting the relations of the company with the public it serves; and has supervision of the twelve territorial divisions of the company, all division managers reporting to him.

These management officers, who among them direct all activities concerned with the operating and service sides of the company's organization, are of quite recent creation. They are part of a plan of general reorganization which was set in motion by the company's administration in the fall of 1920 and completed in the beginning of 1921. In conjunction with their various activities are certain working committees, namely: the president's advisory committee, the engineering committee, the research committee, the employees' welfare committee, the central safety committee, and the appropriation committee.

The financial affairs of the company are in charge of the second vice-president and treasurer, who, in addition, has charge of all accounting, purchasing and warehousing.

Certain forms of both specialized and general service are required by the executive and management officers and by the territorial division managers, such as are rendered by the departments of: General Counsel, Attorneys, Rate Attorney, Claims, Property, Land and Tax, Personnel, Accounting, Purchasing and Supply. The officers in charge of these departments report directly to the executive officers, but are available to all other officers requiring them by direct application.

The operating and service departments represent two dimensions of the organization: the one specializes on a particular kind of operation and the other on a particular kind of service. The third dimension of this organization is represented by geographic division into which the territory served is divided. Each division is a complete unit by itself, under one management, responsible to both operating and service departments for methods of technical efficiency and general control, but acting on individual initiative in application, immediate supervision and the detail of effective accomplishment of concrete tasks. This arrangement provides the man farthest in the field with the same guidance and service as the man nearest the main office.

The system of committees previously referred to provides for the coördination of the work of the various departments and divisions, a review and analysis of all recommendations arising from the ordinary expansion of service, and for the development of all facts and points of view bearing upon any problem.

The results obtained from the reorganization plan have been extremely gratifying. Every subject requiring executive action, every individual appropriation, every important extension, all questions of general policy and all claims or complaints that cannot be adjusted by local representatives within the limits of established policy, are, before reaching the executive officers, subjected to analysis by experts and review by competent managing officers, and their recommendations are available as aids to executive action. By this system executive officers have been relieved of a great burden of routine detail and a marked increase of efficiency in the dispatch of business attained.

The service ideals of the company, special fitness of executives and employees for the tasks, the merited good-will of the employees, have all received the greatest consideration in upbuilding the organization, to the end that the company may give a maximum service at a minimum cost to the people of California.

Industrial Relation Activities. While every effort is bent in this direction the care of the employees, both male and female, is not overlooked. Among special committees already mentioned, special attention is directed to the employees' welfare committee, whose personnel consists of the president, vice-president and general manager, vice-president and treasurer, vice-president in charge of public relations and service, Manager of Claims Department, Manager of Personnel Department, chairman and ex-chairman of the Pacific Service Employees' Association, a member of the Employees' Association, and a member of the Employees' Association elected at large. This committee meets once a month and discusses all matters pertaining to the welfare of the employees of the company.

Then there is the Pacific Service Employees' Association, whose membership enrollment now stands at approximately

5500. It is to all intents and purposes—subject of course to the general policies of the company—an independent organization of men and women banded together for educational and social purposes. Its executive board and committees are chosen not from those in position of authority but from among the rank and file of the company. Its central organization is located in San Francisco, where it maintains a suite of offices under the direction of an executive secretary who receives a salary and devotes his entire time and attention to the affairs of the Association. In addition, every territorial division of the company maintains a sectional branch of the Association with its separate officers and committees and each of these elects a representative to the council of the parent body.

The Association offers special inducements to its members, including outings and other amusement features. There is a death benefit plan which has been in operation for some time, and a disability plan is now in process of formation. For the women members lunch and rest-rooms are provided at various company headquarters; and where available, memberships in the Young Women's Christian Association with the many privileges of athletic recreation it affords. The Association issues a monthly bulletin under the direction of an editor and staff of assistants.

Meanwhile the company has established a general employees' pension fund, which is liberal in scope and provides for honorable retirement as a reward for long and faithful service.

The Department of Engineering. Realizing the need for a department, the major activities of which would lie especially in technical investigation and planning, the management found it desirable to provide a separate unit for handling these features as distinguished from the construction and operation of the properties after completion. As a result the Department of Engineering came into existence in October, 1920. . . .

Externally—that is, with respect to its relations with other departments of the company—the Department of Engineering is charged particularly with responsibility for initiating the necessary engineering program by means of which the company is to meet the demands of its present and prospective consumers not only for the immediate future, but with a far-sighted view to probable requirements for a five-year, ten-year, or even longer period to come. The company stands committed to the policy that its own prosperity, as well as the material prosperity of the territory which it serves, depends upon the economical, timely and intelligent development of the power resources of the State. . . . It stands in the relationship of a service department to the outlying operating divisions and to those other departments which have primarily operating, business or financial characteristics.

Inasmuch as the company is primarily an electrical utility . . . electrical engineering, including generation, transmission and distribution, demands major consideration. Civil engineering in the form of structures, hydraulics, irrigation and water supply is involved through the operation of the secondary properties related to and growing out of the primary electrical properties. Steam engineering and street-railway work also arise. Architecture relating to the proper housing of equipment and personnel likewise becomes important. . . .

Three divisions were accordingly built into the organization to function in these more or less distinct fields. . . .

Two allied bureaus were also created, the one to handle specifications and estimates and the other tests and inspections, . . . for the purpose of coördinating those functions among the three divisions.

Internally, the Department of Engineering follows a functional organization with little or no suggestion of either the staff or line forms. The deliberations preceding its organization developed the fact that two primary functions, investigation and design, were to be intrusted to the new department. . . . This further subdivision has been carried into the three divisions by the formation of branches, one of which specializes in studies and investigations, and the other attending particularly to practical planning and designing. . . .

Electric Distribution and Steam Engineering. The Division of Electric Distribution and Steam Engineering has been largely engrossed in the distribution problems connected with the Pit River power after its arrival in the San Francisco Bay region. This division is furthermore required to devote considerable time to the problem of steam generation, since the reliability of hydroelectric generation and transmission is not sufficient at the present time to warrant the abandonment of steam reserves at the large load-centers, where continuity of certain preferred service must be assured.

The activities of the Division of Civil Engineering embrace extensive studies of power and irrigation possibilities at many points throughout the northern and central parts of the state, that data may be available for extension when it shall become necessary. All field parties on exploration, preliminary and final surveys, including the railroad location from Bartle to the Pit River plants, are under the direction of this division. Considerable attention is devoted to the design of suitable structures in which to house the generating, transmission and distribution equipment. . . .

Specifications and Estimates. The Bureau of Specifications and Estimates is one of general service to the entire department in that it is called upon to coöperate with and coördinate the activities of all the other subdivisions. It has in addition constant contact with a number of outside departments, arising through the solicitation of proposals, preparation of specifications for contracts, the issue of construction drawings, and similar features in which other departments have interest.

The work of this bureau with respect to any particular problem usually begins with the preparation of the General Manager's estimate, by which certain funds are appropriated for the work at hand. Data for this purpose obtained from investigations conducted within the division which has the major interest in the work are combined with data furnished by others concerned, and crystallized into definite form for approval.

It is proper that the drafting room with its chief draftsman should have been placed in this bureau, since the preparation of the drawings for all but the most minor work requires the joint attention of two, and not infrequently three of the divisions. Conference is furthermore had with the Department of Electrical Construction and Operation, since it is of the utmost importance that the design of new construction shall include all elements of value which may be derived from operating experience and shall meet the requirements of those departments which are to be held responsible for satisfactory performance. The same observations may be made of specifications which accompany the drawings. By centralizing these functions in one bureau, the drawings and specifications which are but partial expressions of the same conception can be made strictly to accord with the thought and experience of those most familiar with the problem, and to coöperate with each other.

Inasmuch as a sharp distinction can be held between architecture and other types of drawing, the architectural draftsmen have been placed under an architectural assistant in the division of civil engineering in which they are exclusively interested, rather than with the remainder of the drafting force.

The Bureau of Tests and Inspections was created apart from the other subdivisions of the department in the belief that its functions could be more satisfactorily and painstakingly performed by a disinterested unit which would have no part in either the design and specification of the materials and equipment before purchase, or in their use in construction after purchase. This separation of inspection from design is in further accord with the general scheme of functional organization obtaining throughout.

The staff for this purpose includes in addition to the local testing organization, with its rather complete equipment at the testing laboratory, several traveling inspectors representing the company at outlying plants in this vicinity and in the eastern manufacturing centers. The activities devolving upon this bureau are of the most general character and include tests and inspections of every conceivable object, from a 194-foot special transmission tower or a 35,000-kilowatt generator, to the calibration of a delicate electrical instrument. Considerable attention is given to the standardization of meter testing throughout the system, for which purpose apprentice meter testers are recruited . . . and after training in the laboratory are returned to their respective territories. . . .

35. The Bell System Organization *

Now let's look at the Bell System and see what it is. There are several different points of view from which we can look at it. The first is we can think of it as consisting of 17,000,000 telephones scattered all over the United States, 12,000,000 of which are owned by Bell companies, and about 4,000,000 or 5,000,000 of which are owned by connecting companies. These companies are not an integral part of the Bell System but we connect with them for the rendering of a common service. The total number in the Bell System, now 17,000,000, is increasing at the rate of about three-quarters of a million a year. We have very close relations with the Bell Telephone Company of Canada and in addition connect with Cuba and small parts of Mexico. It is a large telephone development that we are dealing with. In the United States there is about one telephone for each seven inhabitants. In Europe the figures are one for each seventy. In

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* Adapted from a speech by Bancroft Gherardi at Bell System Educational Conference on Economics and Business; issued in pamphlet form, by the American Telephone and Telegraph Company (New York, June, 1926), pp. 43-45.

Great Britain there is one telephone for each twenty-five persons. . . .

Another way of approaching the Bell System is to think of what is necessary to make these connections. There are 45,000,000 miles of wire, 90 per cent of it in cable. This wire extends from the subscribers' stations to switchboards, located at thousands of points all over the United States. There are hundreds of switchboards in a single place like New York City; one switchboard in a small place in the country. Not only do wires run from the telephones to these switchboards but there are wires running between these switchboards serving to connect them with each other.

Still another way of thinking of the Bell System from a business point of view is to think of it as representing $3,000,000,000 of capital which has been invested in fixed property for the rendering of telephone services which property has certain obligations to those who have provided the money and on which there will be a very serious economic waste if that property does not serve a useful purpose to the community and furnish a return to the investors.

A fourth way of thinking of the Bell System is as an aggregation of 350,000 employees who must be trained, supervised and directed in their work to the end that service may be rendered and, as I have already mentioned, must be treated fairly and justly that they will be loyal and contented and interested in rendering really good service.

We are now getting somewhere near the problem that I was asked to speak about, the problem of operating. Before speaking about that I want to say a few words about the organization as a whole, which includes considerably more than operation. The organization as a whole, of course, must include the development, manufacture, construction, maintenance, operation, accounting, treasury work, financial work, the legal work and other classes of work.

It is a pretty large and it is a very diversified job, and like any other large and diversified job, it requires both a large and a complex organization to do the work. Sometimes you hear people say, speaking about some organization or other, "Oh, the organization is too complicated. It ought to be made simple." Maybe it is too complicated in the case spoken of or maybe it isn't. Of course fundamentally an organization is nothing but division of labor. The nature of that division, of that organization must become more complicated as there is more labor to be done and as there are more different kinds of things to be done.

The general organization of the Bell System is this: in the first place, there are about seventeen Associated Companies, or as we often call them, operating companies. The territory of those seventeen operating companies covers the entire United States. Each of you living in the United States (unless you live in the area served by a connecting company) receive service from some one associate or operating company of the Bell System and you have your business relations with that company.

There are seventeen of these operating companies, but we have now twenty-five operating units. There is one case in which two companies are included within one operating unit, and three of the largest companies are subdivided into two or more operating units. From an organization standpoint, you can think of the territory of the United States being covered by twenty-five territorial operating subdivisions.

The second feature of the organization of the Bell System that I want to speak of is what is known as the Long Lines Department of the American Telephone and Telegraph Company. The Long Lines Department is the department charged with the function of connecting the different operating units of the Bell System. It serves as a tie to take care of the calls which go from one operating unit to another operating unit, sometimes traversing the territory of one or more intermediate operating units.

The third feature of the Bell System organization to be mentioned is the Western Electric Company, which is the manufacturing, purchasing and supply department of the Bell System.

The fourth feature of the organization is the American Telephone and Telegraph Company, its President and its Board of Directors, serving as the tie that connects the whole together in a single administrative whole; and the General Staff of the System, which, under contract with all of the associate companies, provides them with certain definite services.

Now coming down to the operating problem itself, each of the Associated Companies has one or more operating departments. There are a total of twenty-five of these, as I said, usually one per company. Each operating department is in charge of a Vice President or General Manager and is divided into four principal parts.

One is the Engineering Department which has to do with the planning within the company's area. The second is the Plant

Department which has to do with the construction and maintenance or upkeep of the physical plant—the lines, the stations, the switchboards, buildings, etc. The third is the Traffic Department which has to do with the putting up and taking down of connections as ordered by the subscribers, and with all of the related problems that arise from handling 50,000,000 or 60,000,000 calls a day and the direction of perhaps 150,000 telephone operators. The fourth subdivision of the operating problem is represented by the Commercial Department which has charge of all of the business relations between the company and its customers and, in most cases, all of the business relations between an Associated Company and its connecting companies.

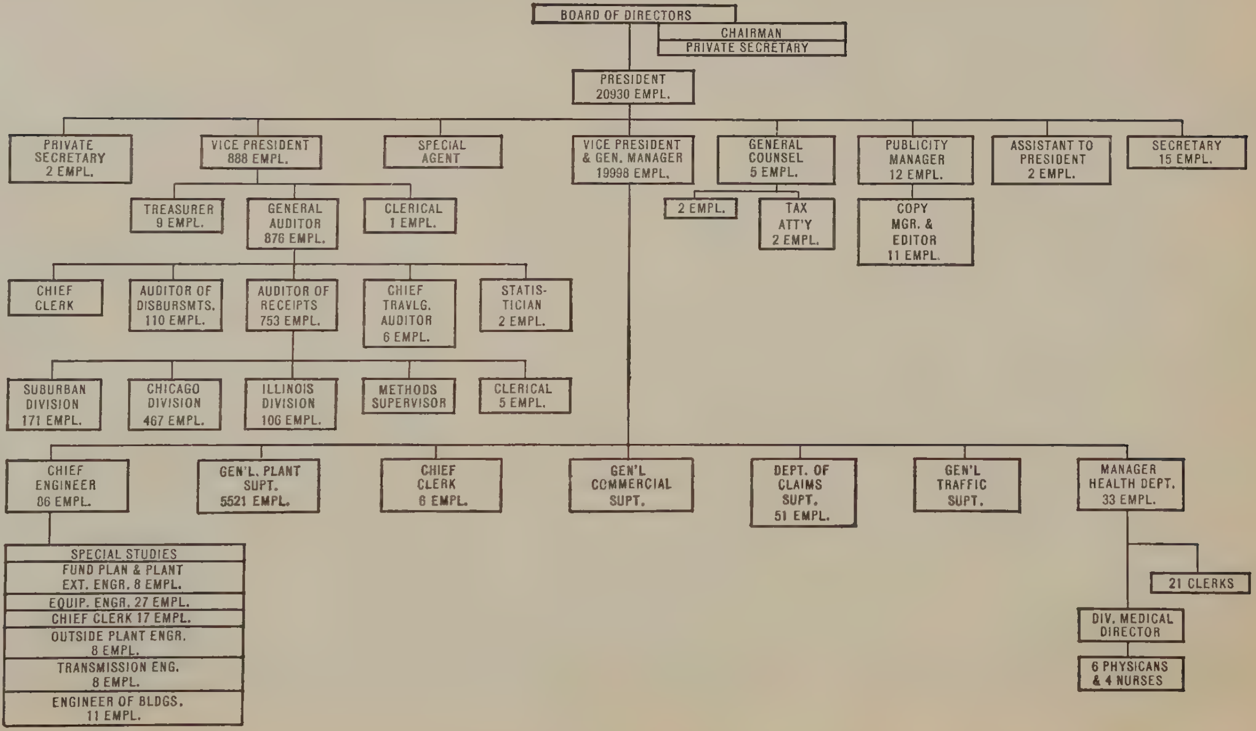
I don't want you to think that these four operating departments which I have named are entirely separate entities which go off on their own hook and each one of which does its part of the business without regard to the others They are coordinated by the General Manager of the company. It is their duty to do their part of the work in such a way that the combined result of the work of all four departments is best from an over-all standpoint.

Here at headquarters as part of the organization of the American Telephone and Telegraph Company there is a staff of operation. That staff of operation performs certain functions which either cannot be performed by the associate companies for themselves or which can most conveniently be performed at one central point. That is, we do once for all, things which can best be done that way. We render consulting advice to them on all operating questions. We make comparison between the operating performance of different parts of the System and make the information available for all of the Associated Companies. We give them operation information of all kinds and descriptions which we think would be helpful to them in their work.

In fact, what we undertake to do is to be informed on every phase of operation, to advise them in regard to the results of their operation, advise them in regard to better operating methods that may be developed either by us or by any one else and, generally speaking, to do all that is necessary, to obtain at one and the same time the advantage of local organizations throughout the country each autonomous in character, and also the advantages which can only be obtained through one centralized group having all of the information of the System available at one place and having all of the resources which can only be lodged in a single centralized group.

36. A Telephone Company Organization

Chart 15


BOARD OF DIRECTORS
CHAIRMAN
PRIVATE SECRETARY
PRESIDENT 20930 EMPL.
PRIVATE SECRETARY 2 EMPL.
VICE PRESIDENT 888 EMPL.
SPECIAL AGENT
VICE PRESIDENT & GEN. MANAGER 19998 EMPL.
GENERAL COUNSEL 5 EMPL.
PUBLICITY MANAGER 12 EMPL.
ASSISTANT TO PRESIDENT 2 EMPL.
SECRETARY 15 EMPL.
TREASURER 9 EMPL.
GENERAL AUDITOR 876 EMPL.
CLERICAL 1 EMPL.
2 EMPL.
TAX ATT'Y 2 EMPL.
COPY MGR. & EDITOR 11 EMPL.
CHIEF CLERK
AUDITOR OF DISBURSMTS. 110 EMPL.
AUDITOR OF RECEIPTS 753 EMPL.
CHIEF TRAVLG. AUDITOR 6 EMPL.
STATISTICIAN 2 EMPL.
SUBURBAN DIVISION 171 EMPL.
CHICAGO DIVISION 467 EMPL.
ILLINOIS DIVISION 106 EMPL.
METHODS SUPERVISOR
CLERICAL 5 EMPL.
CHIEF ENGINEER 86 EMPL.
GEN'L. PLANT SUPT. 5521 EMPL.
CHIEF CLERK 6 EMPL.
GEN'L COMMERCIAL SUPT.
DEPT. OF CLAIMS SUPT. 51 EMPL.
GEN'L TRAFFIC SUPT.
MANAGER HEALTH DEPT. 33 EMPL.
SPECIAL STUDIES
FUND PLAN & PLANT EXT. ENGR. 8 EMPL.
EQUIP. ENGR. 27 EMPL.
CHIEF CLERK 17 EMPL.
OUTSIDE PLANT ENGR. 8 EMPL.
TRANSMISSION ENG. 8 EMPL.
ENGINEER OF BLDGS. 11 EMPL.
21 CLERKS
DIV. MEDICAL DIRECTOR
6 PHYSICANS & 4 NURSES

38. Statistics: Telephone Companies *

TABLE 14

SUMMARY—ALL SYSTEMS AND LINES: 1922

	ALL SYSTEMS AND LINES	BELL SYSTEMS	ALL OTHER SYSTEMS AND LINES	
			Reporting Annual Incomes of $10,000 or More	Reporting Annual Incomes of Less than $10,000
Number of Systems and Lines	57,253	26	1,297	55,930
Miles of Wire	37,265,958	30,613,687	4,889,296	1,762,975
Number of Telephones	14,347,395	9,514,813	2,780,421	2,052,161
Revenue, Operating and Non-operating .	$684,923,557	$565,069,625	$91,754,283	$28,099,649

39. "Obligations Under the License Contract" †

The telephone business had its inception in the invention of Alexander Graham Bell. The license contract, licensing the Associated Companies to use the Bell patents, is the fundamental basis of the Bell System organization. It determines the structure of the Bell System, and provides for universal service to be secured through a combination of two separate services; one to be rendered by the American Company, and the other by the Associated Companies.

In addition to the licenses under the original patents and thousands of later ones this contract provides for vitally important services to be rendered to the Associated Companies by the American Company. Beginning with the instrument service, the scope of these services has broadened with the development of the art, until they now include whatever assistance is necessary to the most efficient and economical development of the telephone service in the United States.

The license contracts are all identical in their basic provisions. A summary of the obligations of the American Company and of the Associated Companies under these contracts, accurate except in the omission of some minor details not essential to a comprehensive view of the situation, follows:

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* Bureau of the Census, *Census of Electrical Industries—Telephones 1922* (Washington: United States Government Printing Office, 1924), p. 7.

† N. T. Guernsey, *Bell Telephone Quarterly*, III (1924), 90-99.

Obligations of the American Company

1. The American Company undertakes to provide an adequate supply of telephones and to deliver them to the Associated Companies as needed by them, and as selected by the Associated Companies from the standard patterns of the American Company.

The Associated Companies are licensed (a) to use such telephones and to grant to their patrons and certain others the right to use them in their respective territories, including their use upon the lines of the exchanges of the Associated Companies, upon extraterritorial connecting lines, and in connection with certain of the trunk or long-distance lines of the American Company; (b) to permit their use upon the lines of sub-licensees and connecting companies, and upon farmers' and like lines and upon lines operated by railroads; and (c) to use them upon private lines and the lines of private inter-communicating systems.

The right of the Associated Company to use these telephones within its territory is exclusive, with minor exceptions, except as against the long-distance lines of the American Company; but is upon the condition that the Associated Company shall satisfy all reasonable demands for exchange and toll-line service within its territory at just and reasonable rates.

The American Company undertakes to replace and repair all defective telephones returned to it, and to furnish without charge all parts for making replacements in telephones which the Associated Company has in service or on hand.

2. The American Company undertakes to license the use of inventions in call-bells, switches, switchboards and other telephonic devices, apparatus, methods and systems needed for the telephone lines of the Associated Company upon the same terms to it as to others under like circumstances.

It also agrees to permit the Associated Company to use all telephonic devices, apparatus, methods and systems covered by the American Company's patents; with the right to use, when completed and standardized, all new and improved apparatus and developments in the art of telephony resulting from the research and experimental work of the American Company.

It further undertakes to render available to use by the Associated Company all products of the American Company's development and research work and all apparatus, appliances, methods and systems embodying inventions, discoveries and patents relating to the art of telephony and recommended for use by the American Company.

3. The American Company gives the Associated Company the right to use any of the American Company's rights-of-way and similar franchises, including the use of the American Company's overhead and underground facilities, so long as such use shall not interfere with the enjoyment thereof by the American Companies; this use to be subject to the consent thereto of Public Service Commissions, if such consent is required by law.

4. Without expense to the Associated Company, the American Company undertakes to defend and insure the Associated Company against judgments for damages in all actions against it for infringement of patents arising out of the use by it of telephones furnished under such contracts or of any apparatus, methods or systems which the American Company may recommend.

It also undertakes to render advice and assistance in patent matters.

5. The American Company undertakes to continuously prosecute the fundamental work of research, investigation and experimentation in the development of the art and science of telephony; and in the development of plans, methods, systems and ideas for the promotion of; and safety, economy and efficiency in the equipment, construction and operation of the telephone plant of the Associated Company; and agrees to direct certain development work to be done by others.

6. The American Company undertakes to give advice and render assistance in general engineering, plant, traffic, operating, commercial, accounting (including the auditing of accounts), patent, legal, administrative and other matters pertaining to the efficient, economical and successful conduct of the Associated Company's telephone business.

7. The American Company undertakes to give advice and render assistance in any financing required to be done by the Associated Company in the extension, development or improvement of its telephone system and in the general matter of its finances; to aid in securing funds for it on fair terms for new construction and other expenditures; and to render active assistance in marketing its securities.

8. The American Company undertakes to give to the Associated Company the right to extend to its subscribers and other patrons and to those of its connecting companies the privilege, upon the payment of the regular tolls, of using the lines of the

American Company for communication to and from one another's subscribers including those of their connecting companies; and continuously to construct, maintain and extend for such use the proper circuit and other facilities for connections between the territories of the different Associated Companies.

9. The American Company undertakes to render to the Associated Company active assistance, coöperation and support in the adoption of measures for the protection and preservation of the health and to promote the well-being in employment of its employees, and, continuously to maintain, at not less than its original amount, the fund established by the American Company in its "Plan for Employees' Pensions, Disability Benefits and Death Benefits," with the right to the Associated Company to have recourse to that fund in case of a deficiency in the fund established by it under its "Plan for Employees' Pensions, Disability Benefits and Death Benefits."

10. For the betterment of the service in its territory, the American Company undertakes to give to the Associated Company the right to extend to its connecting companies, on terms and conditions to be determined by it, the benefit of any engineering and other technical advice and information relating to the construction, maintenance, repair and operation of plant, which the Associated Company may receive from the American Company.

11. The American Company undertakes to maintain continuously an organization of specialists trained in the various branches of work to be done by the American Company in rendering the various services above mentioned, sufficient in number, and equipped with adequate technical knowledge and experience.

OBLIGATIONS OF THE ASSOCIATED COMPANIES

1. The Associated Company obligates itself, unless specially authorized by the American Company, not to directly or indirectly connect any line or telephone exchange with the trunk lines reserved to the American Company.

2. The Associated Company is obligated not to dispose of the telephonic devices, apparatus, methods and systems described in Article 3 of such license contracts without the consent of the American Company, except to those licensed by the American Company to use the same or to the licensed manufactures of the American Company.

3. The Associated Company grants the American Company

the right to enjoy certain of its rights to construct and maintain trunk lines from its several exchange offices to points outside of such exchanges, and also grants to the American Company the right to use certain of the Associated Company's overhead and underground facilities.

The Associated Company admits the right of the American Company to use telephones on lines passing over the routes of the lines of the Associated Company, but connecting places with which the Associated Company is not authorized to connect. The Associated Company obligates itself to permit the American Company to connect the wires of any such lines with its lines in order to make up a through line.

The Associated Company is also obligated to make convenient switchboard or other connections for the purpose of passing communications over such through lines, and agrees to take as its compensation for the use of its lines in this connection and for making such connections a share of the through toll prorated according to distance; it also agrees to require the subscriber to bind himself to pay the tolls for such communications and to hold the American Company harmless from all loss or expense growing out of such communications. This use is subject to the consent thereto of Public Service Commissions, if such consent is required by law.

The Associated Company is obligated to permit the American Company to enter its offices and connect its exchanges with any point either within or without its territory with which the Associated Company is not permitted to connect; it also obligates itself to permit the American Company to operate such lines and agrees to permit its patrons to use the same; it also agrees to make the switchboard and other connections to facilitate such communications, if requested by the American Company, and to permit the American Company, if it is not satisfied with the manner in which the Associated Company handles such communications, to establish its own offices and trunk and radiating lines for the purpose of transmitting such communications.

4. In so far as the Associated Company can lawfully control the routing of messages, it obligates itself to cause its exchanges to route over the lines of the American Company, and of its appointees, all communications to points outside the Associated Company's territory, and in some cases to points within its territory. The cases last mentioned are exceptional, arising out of combinations of license-contract territories through consolidations.

The Associated Company agrees to render an accounting to the American Company as to each such communication and to collect and pay over to the American Company, or its appointees, the tolls due it on such communications; to keep and exhibit to the American Company records of such communications and to handle such interchanged business according to the operating methods and rules established by the American Company.

The Associated Company obligates itself, upon request of the American Company, to make proper switchboard and other connections between its lines and the lines of the American Company for the purpose of making up a through line to points without the exchange area of the Associated Company.

5. The Associated Company agrees to pay the American Company a sum not to exceed $5 for any telephones which are unlawfully detained by the Associated Company or lost or destroyed otherwise than by fire or unavoidable casualty. The Associated Company agrees that such payments shall not give it the right to such telephones or to their use or prevent the American Company from obtaining possession of such telephones.

6. The Associated Company obligates itself to return all excess instrument parts to the American Company.

7. The Associated Company admits the validity of all patents regarding telephony and telephonic devices now or hereafter held by the American Company or under which it may hold exclusive licenses, and agrees not to dispute the validity of such patents or licenses or the American Company's title thereto.

8. The Associated Company agrees to pay for the telephones, services, licenses and privileges furnished to it under such license contracts 4½ per cent of its total gross earnings, subject to certain specified deductions; such payments to be made in monthly instalments. The Associated Company is also obligated to make similar payments for its sub-licensees or their connecting companies in which such Associated Company owns a majority of the capital stock. It is provided, however, that under certain circumstances, the Associated Company may apply to the American Company for the remission in whole or in part of the payments based on the gross revenues of any such sub-licensed or connecting company.

The Associated Company agrees to render periodical reports to the American Company, showing the number of telephones in use and in stock in its territory and agrees to make the license payments to the American Company in New York or Boston funds periodically on dates fixed; the Associated Company also agrees to make such further statements of telephones in use or in stock as the American Company may request. The Associated Company also obligates itself to make such reports to the American Company relative to the operation of its exchanges and lines as the American Company may from time to time request.

Under the reciprocal provisions of A 3 for the use of American Company facilities by the Associated Company, and of B 3 for the use of Associated Company facilities by the American Company, each company making such use is required to pay a reasonable compensation therefor based upon cost. Where lines of the Associated Companies are used in making up long-distance lines, the Associated Company is compensated by the American Company through a prorate of revenue. For what is done by the Associated Company in connection with the long-distance service, the Associated Company is compensated by fixed payments made by the American Company. The use of the Associated Company's facilities in establishing connections between an exchange station and a toll switchboard is part of the Associated Company's local exchange service, for which it is paid through its exchange rates.

9. Provision is made for the termination of the contract in the event of the default, bankruptcy or insolvency of the Associated Company; otherwise, the contract is to be permanent.

Where the contract is terminated, the American Company is given the right to purchase the telephone property of the Associated Company in the territory covered by the contract.

10. The Associated Company has not the right to assign the contract without the written consent of the American Company.†

40. Chicago Regional Power System *

This subject is perhaps of real interest at this time for three reasons: first, because of the many new developments in power supply that have taken place as a result of what is popularly called super-power transmission and interconnection; second, because of the rapid growth in the volume of loans; and third, because of the great improvement in efficiency in the production of electricity from coal. . . .

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† Editor's Note—In 1926 the payment of 4½ per cent under B-8 was reduced to 4 per cent, without any other change in the contract; and in 1927 this payment was further reduced to 2 per cent and at the same time the telephones furnished by the American Company under the provisions of A-1, were purchased by the Associated Companies and the American Company was relieved of the obligation to provide, replace, and repair them. In all other essential respects the contract remains unchanged." (Cf. *Annual Report*, 1926, p. 13; and *Annual Report*, 1927, pp. 5-6.)

* Excerpts from paper by Edwin J. Fowler, Statistician of the Commonwealth Edison Company, presented at the Joint Meeting of the W.S.E. and the A.I.E.E., Chicago, Oct. 31, 1927; and from article by G. L. Jorgensen, *The Edison Round Table*, IX (June 15, 1927), 8-9.

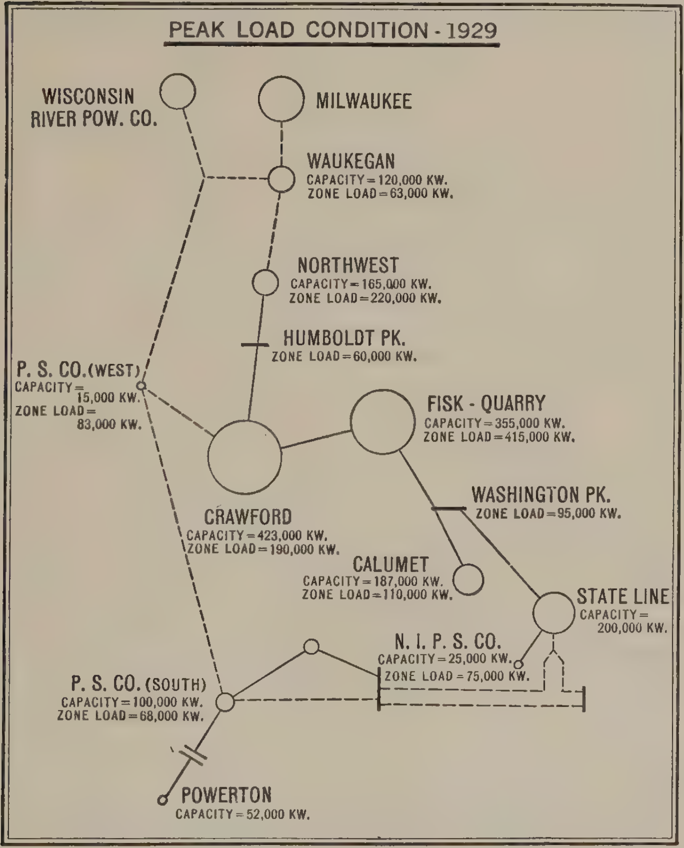
Chart 17, presenting a map of the Chicago District, shows the location of all of the principal power stations and the main transmission lines tying these stations together, the solid lines showing the existing main transmission lines and the broken lines showing those that it is proposed to build in the near future. The heavy lines indicate the higher voltage lines, that is, 66,000 and 132,000 volts, and it will be noted that the main power stations in Chicago Region are already tied together with high voltage transmission lines. . . . It will also be noted that the Chicago system is interconnected with the Milwaukee system on the north and with the American Gas and Electric system on the east, and interconnection with the Illinois Power and Light Corporation on the southwest is under construction and will go into service this winter, and that mainline super-power interconnection is definitely planned to the west and northwest.

As a basis for the estimate of the maximum load for the next five years the percentage of increases that have been realized by each of the three companies for the past ten years was determined.

For purposes of study and to aid in the determination as to where additional generating capacity should be installed, these estimated loads and capacities are summarized into two main divisions, namely, north and central zone, and south zone. . . .

In addition to the portrayal of the load and capacity of what we would consider as more strictly the Chicago District, there is . . . the Powerton Station now under construction by the Super-Power Company of Illinois. The control of this company, through ownership of the common stock, is held by the Commonwealth Edison Company, the Public Service Company of Northern Illinois, the Illinois Power and Light Corporation, and the Central Illinois Public Service Company. . . . The splitting up of the output of this station among the four companies interested has been an interesting problem. The plan that is now proposed is that the total capacity of the station will be allotted to the four companies; at the start the Edison and the Public Service Company agreeing to take 15,500 kilowatts each, the Illinois Power and Light Corporation 16,000 kilowatts and the Central Illinois Public Service Company 5000 kilowatts making up the total of 52,000 kilowatts, which is the capacity of the unit now being installed at the plant. Each company is to pay that portion of the total fixed charges, including interest, depreciation and taxes, that its allotted capacity bears to the total capacity and the agreement is to provide for a re-allotment of capacity whenever conditions arise where one company wishes to increase or decrease its share and the other companies are willing to release or absorb same.

Chart 17 *


PEAK LOAD CONDITION - 1929
WISCONSIN RIVER POW. CO.
MILWAUKEE
WAUKEGAN
CAPACITY = 120,000 KW.
ZONE LOAD = 63,000 KW.
NORTHWEST
CAPACITY = 165,000 KW.
ZONE LOAD = 220,000 KW.
HUMBOLDT PK.
ZONE LOAD = 60,000 KW.
P. S. CO. (WEST)
CAPACITY = 15,000 KW.
ZONE LOAD = 83,000 KW.
FISK - QUARRY
CAPACITY = 355,000 KW.
ZONE LOAD = 415,000 KW.
WASHINGTON PK.
ZONE LOAD = 95,000 KW.
CRAWFORD
CAPACITY = 423,000 KW.
ZONE LOAD = 190,000 KW.
CALUMET
CAPACITY = 187,000 KW.
ZONE LOAD = 110,000 KW.
STATE LINE
CAPACITY = 200,000 KW.
N. I. P. S. CO.
CAPACITY = 25,000 KW.
ZONE LOAD = 75,000 KW.
P. S. CO. (SOUTH)
CAPACITY = 100,000 KW.
ZONE LOAD = 68,000 KW.
POWERTON
CAPACITY = 52,000 KW.

* From Edwin J. Fowler, "Chicago Regional Power System."

Some of the important features of this idea of allotted capacity are, as follows: if for any reason the capacity of the station, because of overhauling or a breakdown, is reduced, the allotted capacity of each of the parties to the contract is reduced proportionally. Another and probably the most important feature is that while each company is entitled to the allotted capacity for which it pays whenever it needs it, if at any time it cannot use or does not use its full allotted capacity, anyone of the other parties to the contract, by agreement with the load supervisors or dispatchers, can make use of same without any increase in the primary payment. For instance, the companies taking power for the districts adjacent to the station might not be able, during the period from around midnight up to 7 A.M. or 8 A.M., to use their allotted capacity and during this time, not only the amount of the allotted capacity of the Edison and Public Service Companies might be fed into the Chicago District system at Joliet, but also the additional amount that the other two parties to the contract Downstate might not be able to or might not wish to use, and this, without any additional primary or fixed charge payment by the Edison and Public Service Companies.

Thus, so far as the agreement is concerned and if practical from the load and operating standpoints, the Public Service and Edison Companies might take off-peak or "dump" power to such an extent that the load factor of their supply, as taken from Powerton figured as a ratio of the average kilowatt to the allotted capacity, might be well over 100 per cent.

As to the secondary or kilowatt-hour charge, each company will pay for the kilowatt-hour taken at the actual average operating cost of the plant, excepting that it is proposed that the charge be adjusted slightly downward for load factors better than the average and adjusted slightly upward for load factors that are poorer than the average. This, of course, is sound rate-making because the company that gives the station a higher load factor is contributing much more to a low average operating cost than the company that gives the station a poor load factor.

There is one additional feature of the Chicago District power supply, . . . the Interchange Energy Contract, under which the capacity of the generating stations of the three companies in the Chicago District are pooled, and under which agreement the most efficient stations are operating up to the capacity of the stations and transmission lines for the benefit of the three parties to the contract.

The three companies to the contract are the Public Service Company of Northern Illinois, operating mainly in the suburban territory surrounding Chicago; the Commonwealth Edison Company, operating within the City of Chicago; and the Northern Indiana Public Service Company, operating in adjacent territory just across the Illinois-Indiana line in the northwestern portion of Indiana.

Up to two and one-half years ago, some energy was supplied by the companies in the Chicago District between one another, on the basis of the old form of contract, involving a primary charge of so much per *maximum* kilowatt *and so much per* kilowatt-hour; but on this form of contract, it was found that each company watched very carefully to see that it did not exceed a certain maximum load and thus increase its primary charge. This, in many cases, resulted in one company not taking the amount of energy that it should have taken from an economic standpoint. Further, the secondary or kilowatt-hour charge was a flat-rate, including some profit, and one company would buy from the other no more kilowatt-hours than was absolutely necessary, even though the company from which it was buying had a more economical station and may have been generating power at a cost per kilowatt-hour considerably under purchasing-company's own cost.

In general the old contracts were not resulting in the most efficient use of the power station and transmission facilities of the District; the company boundary lines formed an artificial barrier against the true economic production of power for the territory.

The many difficulties involved in the use of a measured maximum as a basis for the primary charge and the lack of a reasonable coördination and economic use of the power station facilities of the District by the operating men, because of the measured maximum and the flat secondary charge, resulted in the working out of what was at that time an entirely new plan, as applied to interchange-energy contracts, and that was the pooling of the load and capacity of the three companies and the use by all of them of the available reserve capacity, not on a charge for maximum load delivered, but on a charge per kilowatt for reserve *capacity* that one or more companies may contribute to the pool against the company or companies that are short and draw from the pool.

The method for payment of primary charges is a very radical departure from the old fixed primary rates. Companies having a deficiency in reserve capacity now pay a primary charge to the company or companies having excess reserve capacity. Deficiency in or excess capacity means the amount in kilowatts by which any company's kilowatt capacity is less than or exceeds its system maximum demand.

Firm energy may be supplied to any company in any portion of its territory where it has not sufficient capacity. Where such energy is supplied and where there is no interchange of energy possible, the receiving company pays a line rental for all lines supplying such territory of 12 per cent of the cost of the line per year.

In the ordinary interchange of energy all lines are owned by the supplying company in its territory and by the receiving company in its territory.

Any party having a deficiency in total generating capacity is considered to have established a firm demand equal to the difference between its generating capacity and the system maximum kilowatt plus a number of kilowatt equal of the products of its system maximum and the per cent reserve interchange capacity of the system. This amount will never be in excess of 20 per cent and shall be paid for according to a step-rate primary schedule.

These payments are apportioned to the companies having excess capacity in direct proportion to their excess reserve capacity.

It must be borne in mind that any company having once paid its firm primary, as outlined above, may use as much additional power as it desires limited only by the supplying company's ability to give, with no additional primary charge, no matter how large the amount of power used may be. However, for all energy used, an energy charge must be paid made up as follows:

Coal cost per ton multiplied by pounds per kilowatt-hour divided by (2 plus R) equals cost in mills per kilowatt-hour. R is a differential and varies for each station for which energy is supplied.

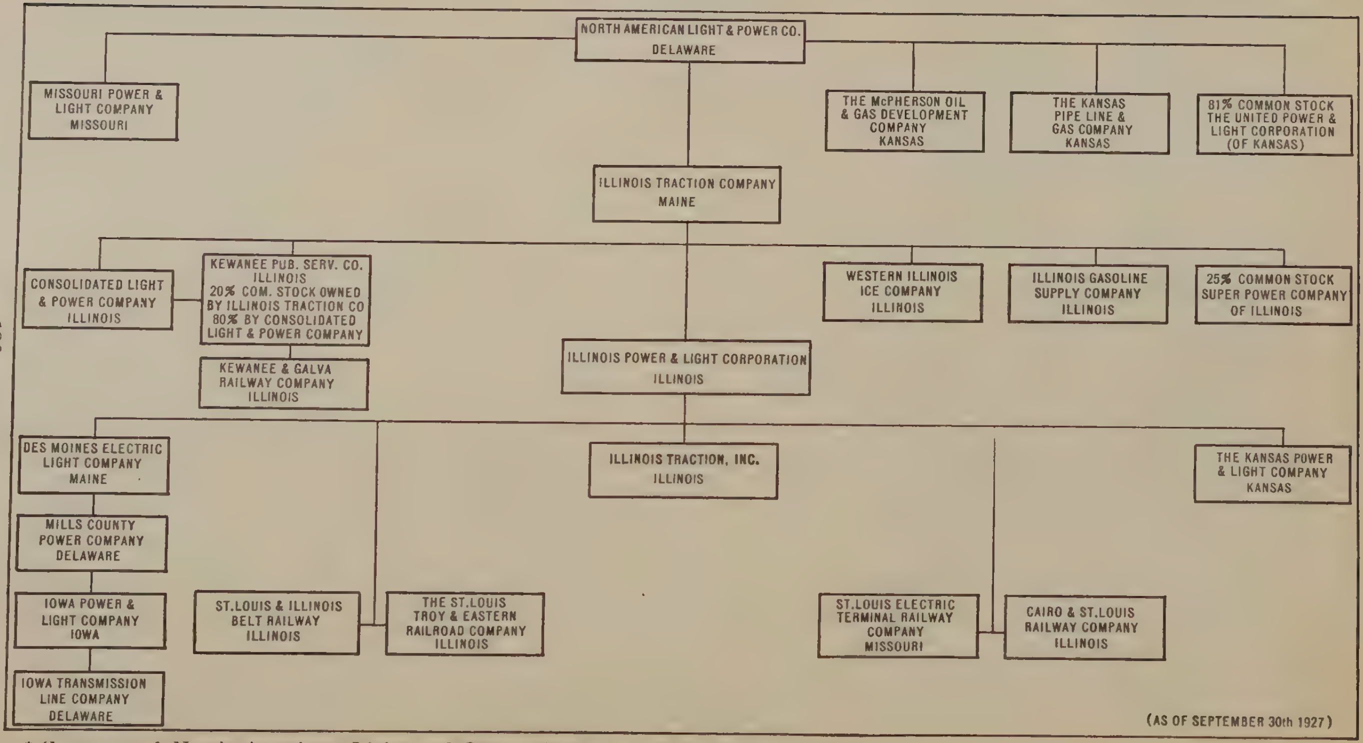
In accordance with the above any company having old and inefficient equipment can shut it down for all periods excepting during the peak, and pay only for its deficiency, if any, in actual capacity, no matter what its off-peak demands may be, thus obtaining the advantage of highly efficient capacity of neighboring companies without being penalized with a double investment charge.

There are two committees, with representatives from each of the three companies on both, which administer this contract and look after the operations of the system according to the provisions of the contract. . . . One of these, the Working Committee, has drawn up a list of the generating stations and agreed upon the rated capacity of each for all three of the companies. The committee also receives a statement of the system maximum load, each month that there is an increase, for each of the three companies; and from the total capacity and the total load for the group, it obtains the total reserve capacity and per cent reserve of the combined companies.

In conclusion, this contract properly applied will give to all companies, as nearly as possible, the advantages they would have if operated as a single unit. This includes the most complete utilization of highly efficient capacity; the fullest benefit of all diversity in the territory with the attendant less investment per kilowatt and better load factor.

41. North American Light and Power Company, Delaware *

Chart 18


NORTH AMERICAN LIGHT & POWER CO. DELAWARE
MISSOURI POWER & LIGHT COMPANY MISSOURI
THE McPHERSON OIL & GAS DEVELOPMENT COMPANY KANSAS
THE KANSAS PIPE LINE & GAS COMPANY KANSAS
81% COMMON STOCK THE UNITED POWER & LIGHT CORPORATION (OF KANSAS)
ILLINOIS TRACTION COMPANY MAINE
CONSOLIDATED LIGHT & POWER COMPANY ILLINOIS
KEWANEE PUB. SERV. CO. ILLINOIS 20% COM. STOCK OWNED BY ILLINOIS TRACTION CO 80% BY CONSOLIDATED LIGHT & POWER COMPANY
KEWANEE & GALVA RAILWAY COMPANY ILLINOIS
WESTERN ILLINOIS ICE COMPANY ILLINOIS
ILLINOIS GASOLINE SUPPLY COMPANY ILLINOIS
25% COMMON STOCK SUPER POWER COMPANY OF ILLINOIS
ILLINOIS POWER & LIGHT CORPORATION ILLINOIS
DES MOINES ELECTRIC LIGHT COMPANY MAINE
MILLS COUNTY POWER COMPANY DELAWARE
IOWA POWER & LIGHT COMPANY IOWA
IOWA TRANSMISSION LINE COMPANY DELAWARE
ST.LOUIS & ILLINOIS BELT RAILWAY ILLINOIS
THE ST.LOUIS TROY & EASTERN RAILROAD COMPANY ILLINOIS
ILLINOIS TRACTION, INC. ILLINOIS
ST.LOUIS ELECTRIC TERMINAL RAILWAY COMPANY MISSOURI
CAIRO & ST.LOUIS RAILWAY COMPANY ILLINOIS
THE KANSAS POWER & LIGHT COMPANY KANSAS
(AS OF SEPTEMBER 30th 1927)

* Courtesy of North American Light and Power Company of Delaware.

CHAPTER III

UNITS AND MEASUREMENTS

42. The Value of Statistics *

The primary purpose of a public-utility statistical department is to serve as an aid to management. In this era of large scale enterprise and of long-distance control, it is very difficult for a manager to keep in contact with all that is going on in his business. Formerly, when small industries were the rule, a manager could know personally all the significant facts about his business with comparative ease. As a result, aids to management such as the methods of statistics were not considered necessary. Under modern conditions, however, all aids to centralized and long-distance control become very important. Statistical departments thus have a definite place in most large enterprises and in many smaller ones, their task being to discover and interpret the facts about the business, and to present their findings to the management in a clear, concise form.

Statistics may be defined as consisting of the methods of collecting, analyzing and presenting numerical facts. Specifically, then, it is the function of the statistical department to make available those numerical facts which will be of service to the management in conducting its business. Although each of the three tasks mentioned has its own problems, all three of them must be done simultaneously. The collection and presentation of data cannot be done intelligently without a great deal of analysis to determine what items are significant.

I. *Indexes of Current Operating Results.* Probably the most important task of the statistical department is keeping the management informed as to the results of current operation. Facts which these current indexes should include may be divided into two classes—(a) those having to do with operating results, and (b) those concerning financial results. Those facts which concern the production, delivery, and selling of the product are operating items. In this class, data relating to operating costs of various kinds are of greatest importance. Financial facts are those which have to do with the acquisition, use and return of capital. These might be said to be chiefly concerned with a particular kind of cost—the cost of capital. Typical examples of each class are (a) the operating ratio, and (b) the rate of capital turnover. The two types, of course, are intimately related. In either of these two divisions, ratios afford much useful information. The trends of the business are in many cases best portrayed by the trends of certain ratios, particularly when taken in connection with each other. Ratios are merely the numerical expressions of significant relationships. For example, the operating ratio is an expression of the relation of operating expense to gross revenue. As it is the connection between facts, not their mere existence, which is most important, the comparison of relationships, or ratios, usually yields much more valuable information than the comparison of the simple data.

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* Barclay J. Sickler, "Functions of a Public Utility Statistical Department," *American Gas Journal*, CXXX (March, 1929), 45-46.

As has been said, operating statistics most often have to do with costs. Here two important items to be noted are the changing relationships of different kinds of costs to each other, and the connection between costs and operating conditions such as load factors and plant utilization. Changes in unit costs over different periods of time also constitute an important index to the efficiency of operation. These unit costs should cover production, delivery, and merchandising of the product, as well as the costs of administering the organization. Not only costs per unit of product, but also costs per customer and per unit of demand should be watched. Certain kinds of costs should be compared to the production, while others are more significant when compared to the number of customers or to demands. This is true because the amount of some items of cost are determined by each of these factors. The peculiar economic characteristics of public utilities, requiring as they do, connection to each customer and a continual readiness to serve, are responsible for the complexity of these cost relationships.

Significant financial relationships are chiefly those which concern the efficiency and profitableness of the use of capital. Most important of these are ratios of earnings to financial requirements, and of gross and net earnings after various charges have been met to investment and to net worth. In addition to relationships of this nature, changing ratios of capitalization should be watched.

Such simple things as comparative gross and net revenue, and physical quantities produced and sold are likewise very serviceable indicators of the trend of the business, especially in public utilities where few inventories are necessary and the collections problem is reduced to a minimum. These items possess the great advantage of being easily understood.

The facts and relationships selected as being significant should always be presented in comparative form. A figure or ratio by itself means very little. Only when compared to a standard of some sort does it possess its greatest value. Standards may be obtained either from within the organization or from outside. Those derived from within are ordinarily of two types—comparison with previous similar periods of time, and comparison of different plants. The holding company is particularly adapted to make this latter type of comparison. Comparison may also be made with some figure which has been selected as ''normal.'' Standards from outside the organization may be obtained from averages over the entire outside industry or over a particular section of it, or from selected individual plants.

In presenting the facts which best indicate business trends, liberal use should be made of graphics. The value of charts and diagrams as aids to quick and thorough understanding of what is happening, is very great. In no other way can relationships between facts be better brought out, or comparison made more clear. The importance of this ease of comprehension is especially great to a management interested in numerous diverse properties. Charts and diagrams are of many different types, of which the most common are curves and bar charts. A thorough knowledge of the use of all varieties of graphs is essential to the business statistician.

In selecting the facts to be collected and presented in graphic form discretion must be exercised. If the greatest usefulness is to be secured and confusion is not to result, too great detail must be avoided. Only those facts and relationships which are vital in controlling the business should be selected; more detailed investigation may be made when the graphs indicate conditions that need to be remedied. Unless selection is exercised an unintelligible and useless jumble will confront the manager.

II. *Forecasting.* Forecasting work is another task of the statistical department which deserves special attention. The problem is too involved to do anything here except indicate what it is. Obviously, industries like public utilities which require large amounts of fixed investment to carry on their operations are vitally interested in knowing as closely as possible what lies in the future. If growth is to be expected, as it is in most public utilities, considerable time is needed to prepare for it. For these reasons public utilities are all concerned with forecasting of one sort or another. Probably if more of them utilized the methods of statistics in greater degree, they would do this more effectively. The Bell Telephone system has a very elaborate organization to handle its forecasting work, and because of these efforts has been able to meet the exacting demands made on it much more easily and effectively.

The primary problem in forecasting is, of course, to predict the growth of the organization. Because public utilities are monopolies, in their case this resolves itself into predicting the growth of the community served, although consideration of possible new uses and more intensive development of the territory also enters. When once the probable growth of the utility has been determined, the results of this forecast may be applied to the prediction of construction needs, which in turn must be used in determining labor, materials and financial requirements. In performing these tasks the forecasting of prices of construction and raw materials, wages, and interest rates is necessary. Probably only in the case of the largest companies will it be found advisable to do this work in the organization. Numerous outside agencies are now engaged in carrying on this type of work, and usually their results may be adapted to the particular needs of an individual company.

The final step in the use of predictions is their application to the preparation of budgets of various kinds. Construction, financial, and operating budgets are the most important types.

Unless constituted of a very complete and diverse personnel, the statistical department could not carry on this work alone, but certainly it can be of material assistance in its performance. Probably the entire organization would be called on to help carry out all these projects mentioned, and the statistical department might very well have charge of coördinating the work, and presenting the results.

III. *Statistical Study of Special Problems.* These functions of the statistical department in selecting and presenting current operating results and in assisting in forecasting work are very important. As an aid to centralized and to long-distance management the current indexes are well-nigh indispensable. However, almost as fertile fields of work as those mentioned are found in the analysis of special problems which arise from time to time. The importance of quantities produced, costs, revenue, and other numerical facts in the study of many kinds of problems is universally granted. The methods of statistics have been developed particularly for the study of numerical facts, and wherever problems involving such data are concerned, may well be used.

First in importance of these special problems is that of making detailed investigations when the record of current results indicates that something is wrong. In such cases more involved analysis of operating conditions and results may be made, until finally the exact cause of the difficulty is ascertained. When the trouble has been thus localized, the management is in a position to cope with it adequately.

Second in importance may be placed problems involving rates. These are peculiarly adapted to statistical analysis, both in preparing cases for presentation to commissions and in scientific rate-making. The relationship of load curves to costs, the extent and effect of diversity of use, average bills and rates, the probable effect of added customers on cost, and other aspects of rate problems all may be effectively studied by the use of statistical methods.

Special problems in connection with personnel administration also are suited to statistical analysis. Problems illustrative of this type are the study of the relationships among wages, working conditions and efficiency; comparative labor turnover; the effect of welfare work on efficiency of labor and on turnover; the results and best forms of bonus systems; the supply of labor; and amounts and trends of wages and living costs.

The analysis of market conditions is another type of problem adapted to statistical methods. The possibilities of the development of new uses, the degree of saturation of present uses, and comparison of the extent to which markets are developed are examples of such problems.

The comparison of present results and costs with those which might be expected under proposed betterments of plant or changes in policy is also a task in which the statistical department can be profitably utilized.

A more or less incidental use of statistical data is in connection with publicity, either financial or in public and customer relations work. Year books and other matter intended for popular consumption are of this character.

Many such problems exist in public utility management, and statistics may well be used to aid in their solution. Probably none of these, however, is as important as that of presenting current operating indexes. Particularly is this true of holding company statistical departments. Long-distance management is difficult at best, and if the full advantages of centralization and division of the managerial function are to be secured, any device which assists in its successful accomplishment must be embraced wholeheartedly.

43. Public Utility Accounting *

The fundamental purpose of all business accounting is to make accessible information regarding the financial status of the business at a given time, and the financial results obtained by the business during the accounting period. An orderly array of information is essential to the managers of a business in order that they may determine the success or failure of the policies which have been followed.

Accounting is related to the successful conduct of business in a number of ways: It is essential in the financing of growing businesses. Bankers and investors demand adequate data regarding the financial status of the company. Management constantly resorts to accounting records in the determination of future policy and the analyzing of past performance. Administration is concerned with the flow of receipts and expenditures and the results of departmental operations. Accounting statements are of course essential to such work. Accounting is also necessary to the assessing of taxes and to successful auditing.

In addition to its usefulness in the private conduct of a business, the information made obtainable by accounting is often required by governmental bodies in the achievement of intelligent regulation. Particularly is this true in the case of public service industries, where the degree of governmental interference in business activities is relatively great.

State and federal governments have therefore in most cases required uniform accounting procedure by the companies within their jurisdictions, in order to insure correct and comparable data for the use of the regulatory commissions. Coöperation in this work has been extended by associations of utilities as well, for not only are uniform classifications of accounts valuable to the public commissions, but to the companies in that they give smaller organizations the aid of the best accounting methods, and allow comparative analysis of conditions in different utility enterprises.

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* Herbert B. Dorau, manuscript lecture notes, Northwestern University School of Commerce.

Uniform classifications of accounts as specified by the various state public utility commissions or by the Interstate Commerce Commission recognize six main groups of accounts:

1. Balance sheet accounts
2. Fixed capital accounts
3. Income accounts
4. Profit and loss accounts
5. Operating revenue accounts
6. Operating expense accounts

Each of these groups is further subdivided into a large number of accounts, to each of which a uniform classification number is assigned.

The groups of accounts are then used as the basis of making up several kinds of periodic statements regarding the condition and operation of the business: the Balance Sheet, Operating Statement, Income Statement (or account), and the Profit and Loss Account.

All items recording the transactions of the business are brought together in the various accounts of the general and subsidiary ledgers, which include all the accounts of the six main groups. The accounts of the general ledger are summarized to form the trial balance, in which the total of all the debits equals the total of all the credits.

The trial balance contains the data for the Balance Sheet, the Income Statement, and the Profit and Loss Account.

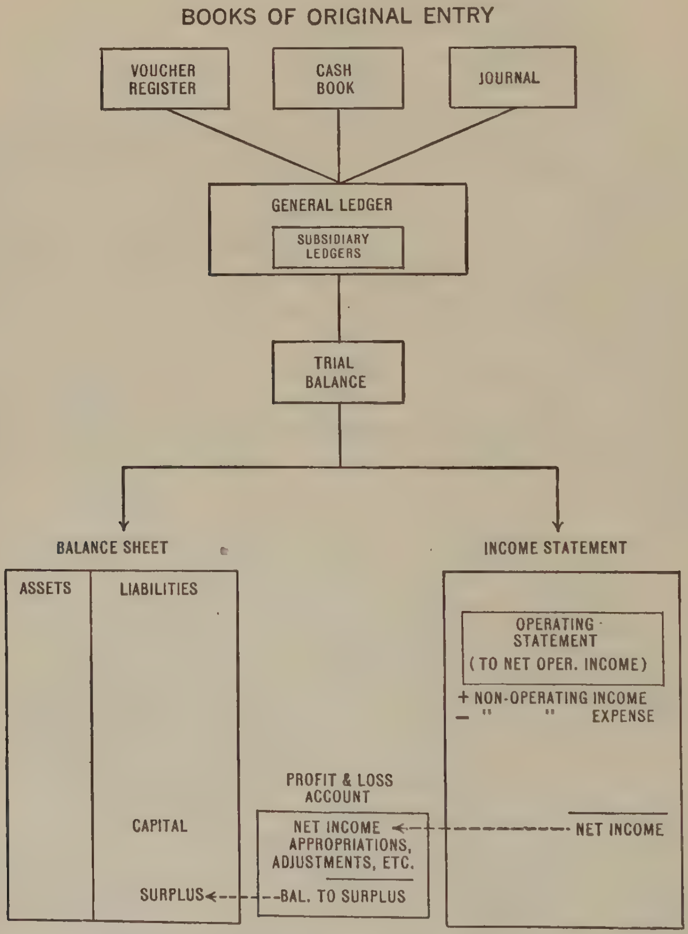
The purpose of the Balance Sheet is to give a photographic picture of the financial condition of the business at a given point of time; to show what the business owes and what it owns. It presents a balanced equation of the business by summarizing the assets (what the business owns), and the liabilities (what the business owes), of the company. The Balance Sheet may therefore be said to be static in character, giving one a view of the status quo of the corporation at a given moment of time.

The operating statement is very different in character. It is dynamic or historical in nature, for it shows in detailed fashion the nature and amount of the operating revenue and operating expense of the business during the accounting period.

The operating statement is extremely important to the managers of the corporation. It makes possible a detailed analysis of business operations and the success or failure of policies which have been pursued by the management.

The income statement presents a summary of the *source* of and *disposition* of all the revenue received during the accounting period. Operating revenue and expenses are the first two items in the Income Accounts. Then follow in standardized order all the sources of non-operating income, and the disposition of receipts. The balance remaining after paying all *necessary* expenditures is called the *net income*. Appropriations (such as dividends) are then made and the balance remaining is transferred to the Profit and Loss Account.

Chart 19


BOOKS OF ORIGINAL ENTRY
VOUCHER REGISTER
CASH BOOK
JOURNAL
GENERAL LEDGER
SUBSIDIARY LEDGERS
TRIAL BALANCE
BALANCE SHEET
ASSETS
LIABILITIES
CAPITAL
SURPLUS
INCOME STATEMENT
OPERATING STATEMENT (TO NET OPER. INCOME)
+ NON-OPERATING INCOME
— " " EXPENSE
NET INCOME
PROFIT & LOSS ACCOUNT
NET INCOME
APPROPRIATIONS, ADJUSTMENTS, ETC.
BAL. TO SURPLUS

The Profit and Loss Account is the connecting link between the Income Account and the Balance Sheet. Its purpose is to show changes in the corporate surplus or deficit during a given fiscal period, as affected by:

(1) The net result of all transactions reported in the income account.
(2) Appropriations of surplus.
(3) Special and unusual transactions or adjustments not belonging in the income account or elsewhere.

The balance in the Profit and Loss Account at the completion of these adjustments is then placed in the Balance Sheet.

44. Uniform Accounting Systems Advocated by Utility Commissioners *

The advantages of a uniform accounting system for each type of utility throughout the United States had been recognized for several years, but not until 1919 was definite action taken toward the establishment of such uniformity. At the annual convention of the National Association of Railway and Utilities Commissioners held in Indianapolis in 1919, the Committee on Statistics and Accounts of Public Utilities was authorized to formulate and present to the individual state commissions uniform accounting systems for public utilities other than railways. The National Association received the report of the committee at the next convention, held in Washington, D. C., on November 12, 1920. The report consisted of the complete system of accounts for gas utilities and for electric utilities, but not for others. They were to be prepared later. . . .

Twenty-five states have adopted the uniform accounting system for electric utilities. The same states have, practically without exception, adopted the system for gas utilities. They are: Alabama, Arizona, Arkansas, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Kansas, Massachusetts, Maine, Michigan, Nevada, New Jersey, New York, North Dakota, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

The Public Service Commission of Oregon has adopted the system for electric companies (and, presumably, for gas companies), beginning January 1, 1925. . . . Massachusetts, Maine and New York have adopted it with slight modifications, in order to comply with some of the state laws. . . .

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* Excerpts from article by Hiram J. Scovill, *The Journal of Land and Public Utility Economics*, I (1925), 276-291.

Thirteen states have not adopted the uniform classification, namely: District of Columbia, Louisiana, Maryland, Missouri, Montana, New Hampshire, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island and South Dakota. Of these states, North Carolina has issued a form of annual report based on the classification of the National Association of Railway and Utilities Commissioners, and will very likely follow it with a classification of accounts. . . . Although Maryland has not adopted the classification of the national association, its commission has issued an order allowing two of the largest companies in Maryland to use it.

Of the eleven other states not mentioned above, one, Delaware, has no utilities commission; California has adopted the classification of the Federal Power Commission, and nine are not under the jurisdiction of the commissions with respect to accounts of electric companies. These nine are Florida, Iowa, Kentucky, Minnesota, Mississippi, Nebraska, New Mexico, South Carolina, and Texas. In the states in which the commissioners have no jurisdiction over the accounting of utilities, most of the larger electric companies (at least) are following the classification adopted by the National Association of Railway and Utilities Commissioners. . . .

A movement is under way to establish uniform annual reports. The national association, at its 1924 convention, held in Phoenix, Ariz., adopted a standard form of annual report for electric and gas companies and recommended the same for adoption by the several states. At this same convention, a simplified classification for use of the small Class C and Class D electric utilities was also adopted. . . .

The authors of the uniform systems suggested by the National Association of Railway and Public Utility Commissioners cannot be given credit for building a new structure from the ground up. . . . The systems of the Interstate Commerce Commission and of the better state utilities have been used to a large extent in the preparation of the systems finally approved by the association. The task of modifying, however, even to the slightest extent an existing system of accounts and the descriptive classification thereof is a very exacting one because of the intricate interdependence of items throughout the manual. . . .

There are four classes of utilities provided for in the gas and electric utilities, as follows: Class A—Corporations having average annual operating revenues exceeding $250,000; Class B—Corporations having average annual operating revenues exceeding $50,000, but not over $250,000; Class C—Corporations having average annual operating revenues exceeding $10,000, but not over $50,000; Class D—Corporations having average annual operating revenues of $10,000 or less. . . Utilities have the opportunity of exercising considerable initiative with respect to the methods of keeping their accounts. . . .

By a unique numbering system the accounts prescribed for utilities of each class are clearly designated. It is among the expense accounts only that any distinction is made between one class of utility and another. In the asset, liability, and income accounts, there is little, if any, opportunity for the commission to offer an option of account titles if it expects to have fundamental information presented through the accounts.

The method of relieving the smaller companies from keeping the numerous expense accounts required of the larger ones may be illustrated by quoting from the "*Uniform System of Accounts for Electric Corporations.*" One of the main divisions of expense is called "Distribution Expenses." In the classification the accounts to be kept under this heading are shown as follows:

				740	Distribution Expenses
D				741	Distribution operation and maintenance
	C	B	A	741.1	Distribution superintendence
	C	B		741.2	Distribution supplies and expenses
			A	741.21	Distribution maps and records
			A	741.22	Distribution office expenses
			A	741.23	Distribution miscellaneous expenses
	C	B		741.3	Operation of distribution lines
			A	741.31	Labor and expense—subways
			A	741.32	Labor and expense—overhead conductors
			A	741.33	Labor and expense—underground conductors
			A	741.34	Labor and expense—telephone system
	C	B		741.4	Meter operation
			A	741.41	Salaries and personal expenses, meter department
			A	741.42	Testing meters
			A	741.43	Miscellaneous expenses, meter department
			A	741.44	Removing and resetting meters
			A	741.45	Removing and resetting transformers
	C	B	A	741.5	Maintenance of underground conduits
	C	B		741.6	Maintenance of lines
			A	741.61	Maintenance of overhead conductors
			A	741.62	Maintenance of poles, towers, and fixtures
			A	741.63	Maintenance of underground conductors
	C	B	A	741.7	Maintenance of services
	C			741.8	Maintenance of transformers and meters
		B	A	741.81	Maintenance of line transformers
		B	A	741.82	Maintenance of consumers' meters
	C	B	A	741.9	Maintenance of buildings and grounds

The tabulation above means that all distribution expenses bear numbers between 740 and 750. It seems, further, that there is only one main subtitle under "distribution expenses," and it is designated as "741—Distribution operation and maintenance." Furthermore, this is the only account the small Class D companies are required to keep to record details of distribution expenses. . . . Class A companies are required to keep all of the accounts shown in the list above, except those six which are reserved exclusively for the smaller companies to use in place of several more minutely classified accounts.

In this specific group, called distribution expenses, it seems that the Class B and Class C companies are required to keep the same accounts except under maintenance of transformers and meters, where Class C companies may keep just the one account designated as 741.8, while Class B companies are required to keep two, designated, respectively, as 741.81, maintenance of line transformers; and 741.82, maintenance of consumers' meters.

A similar distinction between Class A companies and Class B, C, and D companies is made in the other types of expenses. It should be observed in this connection that a company of a given class may use accounts prescribed for a larger company if it chooses, but it may not use those prescribed for a smaller company. For example, a Class D company may use accounts prescribed for a Class A, B, or C company, and a Class B company may use those prescribed for a Class A company, but a Class B company may not use those prescribed for a Class D or C company, except as specifically provided for in the classification. . . .

The Dewey decimal system is used throughout the uniform systems of the National Association of Railway and Public Utilities Commissioners. In the general instructions, however, the authors say: "The numbers prefixed to account titles in this classification are solely for convenience of reference and are not part of the titles or definitions." . . .

The general plan of this system is presented here in outline form:

Asset Accounts

101 Fixed capital
    301–310 Intangible fixed capital
    311 and subdivisions   Land
    312 and subdivisions   Structures
    313–327 and subdivisions   Equipment
    328 Miscellaneous tangible equipment
    351–359 Overhead costs during construction

111–119	Current assets
121–129	Miscellaneous assets, including Funds
131–139	Suspense
141–149	Adjustment accounts
150	Profit and Loss—deficit

Liability Accounts

201–209	Capital stock and similar accounts
211–219	Long-time debts
221–229	Current liabilities
231–239	Accrued liabilities
241–249	Advances from affiliated companies, etc.
251–259	Reserves
261–269	Miscellaneous unadjusted credits
270	Profit and Loss—surplus

Income Accounts

401		Operating revenues
	601–609	Sales of current (or gas or water)
	611–619	Miscellaneous revenues
402		Operating expenses
	701–709	Production expenses
	710–719	Purchased current (or gas or water) and residuals and gas generation for electric utilities
	720–749	Conversion, transmission, and distribution expenses
	750–759	Utilization expenses
	760–769	Commercial expenses
	770–779	New business expenses
	780–790	General and miscellaneous expenses
403		Uncollectible bills
404		Taxes
410–419		Net income from leased properties
421–429		Net income from non-operating properties
431–439		Financial expenses
441–449		Appropriations of net income

The state utilities commissions, in one sense, occupy a position with respect to local utilities similar to that of the Internal Revenue Department of the Federal Government with respect to income taxpayers of the country. They must require a good accounting procedure based on correct accounting principles, but flexible enough to permit of obtaining the same net results under methods best suited to the respective business concerns. At the same time, they must inject enough provisions to permit the commission to control certain actions of the utilities in accordance with the best public policy. . . .

The uniform system of accounts of the railway and public utilities commission is composed largely of instructions which tell the bookkeepers what good accounting principles are in their respective fields. In some cases, it is necessary to describe the keeping of accounts in a specific way, since accountants differ as to theories to be applied. In such instances, the commission deems it best to take a specific stand for one theory or another. In other cases, the commission permits the utility to exercise an option in using one method or another. This makes the system flexible, and is a very desirable feature from the point of view of the utility.

Points in accounting theory which are debatable and on which the authors of the uniform system have prescribed a definite procedure are as follows:

Funds. The system says the "Funds are assets. . . ." It is sometimes contended, though not by the best accountants, that funds are the same as reserves. It is well that the authors covered this item specifically.

Retirement Reserve. One of the most interesting departures from ordinary terminology found in the uniform system is the use of the term "retirement reserve" for "depreciation reserve," and of "retirement expense" for "depreciation expense" or "depreciation." There is no option on this point and the authors feature this by providing that, "If the accounting company has, previous to the effective date of this uniform classification of accounts, maintained a reserve under some other title, such as 'depreciation reserve' for the purpose of equalizing retirement losses, the balance in such reserve, as at the effective date of this classification, shall be transferred to this account."

The adoption of the word "retirement" instead of "depreciation" in both the reserve and the expense accounts seemed of sufficient importance to the subcommittee of the National Association of Railway and Utilities Commissioners to cause it to comment specifically thereon in its letter of transmittal of the system as follows:

> The National Association Committee has recognized the importance of uniform terminology and at the Chicago conference, in April, the constant endeavor was to select terms and definitions which would be as free from ambiguity as possible. It was with this thought in mind that after a prolonged discussion the National Association Committee decided to discard altogether the word "depreciation" and to accept the substitute term proposed by the National Electric Light Association and American Gas Association accounts, "retirement expense." It was felt by all that "depreciation" had come to have so many unfortunate connotations, that clearness and uniformity of interpretation could best be attained by using an entirely different term.

A few rather unusual features are provided for the operation of the retirement-reserve and retirement-expense accounts which are, nevertheless, capable of being supported by logical business expediency. On the other hand, a slight ambiguity is found in one or two of the comments on these accounts. One good feature is that the retirement-reserve account is looked upon as one to provide for replacement of full units of property when they become obsolete or are abandoned for any other reason. In this sense the reserve is not a valuation account and it is not so treated. It is to be credited, and retirement expense charged, with amounts periodically "in addition to the necessary cost of keeping the plant and equipment in a high state of efficiency through charges to the regular maintenance accounts." Furthermore, it is stated that "the losses which this account is intended to cover are those incident to important retirements of buildings, or large sections of continuous structures like gas mains (or electric line), or of definitely identifiable units of plant or equipment, and the object of the account is that the burden of such losses may be as nearly as is practicable equalized from year to year."

With this specific description of the account placed before the utilities, it is apparent that they are expected to have rates to consumers set high enough to permit them to keep all units of fixed property in excellent repair, and also to provide for retaining in the business a sufficient amount of assets to finance the replacement of any substantial amount of fixed property from time to time as conditions seem to demand. A retirement fund for all or any part of the reserve is optional.

A further invitation is extended to the utilities to charge all that is necessary against the cost of operation for such anticipated retirement, in these words:

> NOTE: It is the intent of the classification that a reserve shall be provided sufficient to cover all retirement losses that may reasonably be expected. If the accounting company does not do this, and, later, finds that retirement losses are incurred in excess of that amount that has been provided, the charging of such losses to operating expenses either directly or through the suspense account "property abandoned" does not bind the regulatory commission to the acceptance of such charges as part of the necessary current cost of maintenance.

. . . Depreciation or retirement expense in connection with property has a twofold effect on the financial statements of a business—it tends to reduce the balance-sheet value of the assets and to increase the costs of operation (decreasing profits). In these times, when courts and commissions are ruling in favor of the present replacement cost (less depreciation) as a basis on which to calculate a fair return to a utility, it would seem that any effect of depreciation entries on the balance-sheet is of little importance. The effect on the income statement, however, is of considerable importance. It permits the utility, theoretically, to obtain rates which will enable it to pay ordinary dividends and preserve enough in the business to replace, to any reasonable extent, properties retired for any reason. If a utility should build up its retirement reserve as rapidly as it seems to be invited to do by the wording of the note quoted above, it would be quite sure to have a reserve equal to the balance of the asset account long before the asset was ready for retirement. The result would be that the balance-sheet value of the asset would approach zero while it had an operating efficiency and probably a sale value of 80 per cent of original cost. It is this possible situation which probably causes the authors of the system to provide that retirement reserves shall be shown among general reserves on the liability side of the balance-sheet, instead of being shown as deductions from the fixed assets.

Some misunderstanding is likely to arise from the use of the phrase ''ledger value'' in connection with retirements. It is defined as ''the amount originally charged'' in the paragraph on ''withdrawals and retirements'' under the ''general instructions and definitions of fixed capital accounts.'' In notes A, B, and C, under the description of account number 251, ''retirement reserve,'' the following provisions are made:

> NOTE A: When property is retired whose *ledger value* has been reduced below original cost, only the remaining *ledger value* shall be written off as retirement loss.
>
> NOTE B: When any property is retired whose *ledger value* is greater than the known or estimated cost, such excess shall be charged to profit and loss.
>
> NOTE C: If any property is sold for more than its original cost, the excess of its selling price over *the cost* of the property plus the cost of dismantling and selling, shall be credited to this account.

The rules stated in Notes A and B seem reasonable under the ordinary interpretation of the term ''ledger value,'' but not under the definition referred to above as ''the amount originally charged.'' ''Ledger value'' is usually thought of as the asset balance minus the balance of the reserve account applicable thereto. Note C does not seem reasonable unless ''the cost of the property'' is changed to read ''the ledger value of the property'' signifying asset minus reserve valuation. If Note C is applied as printed, it means that the retirement reserve account is increased by the sale. Assume, for example, a property with a cost of $100,000, including dismantling and selling, against which a reserve of $20,000 had been created at the time of its sale for $110,000. The entry for the sale in accordance with the instructions in Note C would be:

Dr. Cash	$110,000	
Cr. Property		$100,000
Cr. Reserve for Retirement.........		20,000

This would close the property account and leave the reserve account with a credit balance of $30,000. What would this balance in retirement reserve account mean after the property against which it was created had been sold? It would mean that it would be treated as a deferred income to subsequent operations, because for several periods retirement entries could and should be made less for the then existing properties in view of the reserve already set up. An account which thus reduces the periodical charges against operation, increases the profits and, hence, acts as a deferred credit to income. If that is what the commission considers it, then it would seem best to call it that and describe the procedure for a sale of property above cost accordingly. This would still not remove the apparent inconsistency of the use of the words ''ledger value'' and ''cost.''

Discount and Premium on Capital Stock. The uniform system seems to imply that a utility may be given permission to distribute some of its premium on capital stock to its stockholders. It also permits the utility to reduce premium by appropriations from surplus, or by assessment levied on the stockholders. Discount on stock cannot be considered as a part of the cost of operation in any sense nor as a part of cost of construction of physical property. Premium cannot be considered as an income in any sense. Either premium or discount on stock, however, may be adjusted directly through profit and loss for the proportion of premium or discount on stock re-acquired. These principles are in accord with good accounting practice and conform to Interstate Commerce Commission procedures, although they differ from the ideas of those who advocate that discount or premium on stock should remain on the books indefinitely without modification.

Discount Expense and Premium on Long-term Debt. It seems that the straight-line basis of writing off bond discount and expense, on the one hand, and premium, on the other, is required, according to the general description of the subject under balance-sheet accounts. In the description of the accounts, however, both in amortization of debt discount, and expense and amortization of premium on debt, there seems to be an intimation that the more scientific method involving the effective rate of interest is allowable. This idea is obtained from the following sentence: ''This proportion'' (meaning discount or premium remaining unamortized) ''shall be determined according to a rule the uniform application of which, during the interval between the issue and maturity of any debt, will completely amortize or wipe out the discount at which such debt was issued and the debt expense connected therewith.''

There is a well-established rule in connection with bond discount and premium that the discount or premium amortized or accumulated shall follow the interest. That is, the effective interest becomes greater than the nominal interest as discount is written off from period to period, while it becomes less than the nominal interest as premium on bonds is written off. Ordinarily, such additions or deductions from the nominal interest are merged in the interest account at the time of making the entry for the interest payment. In the uniform system under consideration, however, the actual interest paid on long-term debts is charged to the appropriate interest account. The general principle of having discount follow the interest, however, is observed in the end by bringing together the interest and the amortization accounts referred to—both debit and credit—in the same section of the income statement designated as ''deductions from gross corporate income.''

Fixed Capital. It seems rather unfortunate that the title ''fixed capital'' is used rather than ''fixed assets'' as a balance-sheet title. The term ''capital'' from the economic sense is permissible, but from the accounting point of view the term ''capital'' is likely to be confused with the term ''capital stock'' on the other side of the balance-sheet.

Purchase Discount. No account is provided bearing a title ''purchase discount'' or other similar designation. It is intended, it seems, that discounts allowed the utility for prompt payment are to be deducted on the face of the invoice whenever possible, thus reducing the cost of the fixed assets acquired or of the materials and supplies put into stock. In case the utility's method of operation does not make it feasible to deduct the discount before entering the invoice on the books, such utility may credit the discount to miscellaneous construction expenditures or undistributed general expenses, according as such materials and supplies are intended for construction or for use in general operation. The results of utilities are rendered comparable, however, to a certain extent whether purchases of materials and supplies for operation are entered net or gross, because the balance of the account "undistributed general expenses" is included as a part of the costs deducted from gross operating income. If the undistributed general expense were treated as a financial expense, comparison would not be possible between utilities.

Work in Progress. The uniform system provides that the cost of construction work shall be carried in several detailed progress accounts until completed, when proper allocations will be made to the several fixed-asset accounts. Some flexibility is provided, however, and the commission safeguards itself in the matter of allowing duplicate costs to stand on the books for a single unit of property in making the following provision in describing the account "work in progress":

> Charges for additions to fixed capital not involving replacements, or for improvements which necessitate retirements or reconstruction of existing property when full credits have been made in advance to fixed-capital accounts to cover the ledger cost of property retired, may be carried in fixed-capital account number 359, "unfinished construction."

Treasury Securities. The use of the term "treasury securities" to designate those which have been only nominally issued rather than actually issued is very unfortunate. Accounting writers and educators have been trying, for a number of years, to have the terms "treasury stock" or "treasury bonds" applied only to such securities as have been issued and outstanding at some time, but which have been received back into the treasury of the issuing company either by gift or purchase. During the past few years all indications have pointed to the substantial adoption of that meaning in all industrial, commercial, and financial accounting. The authors of the uniform systems for utilities, however, seem to use the term "re-acquired securities'' for those which have been received back by gift or purchase. The term treasury securities is then used in place of ''unissued securities,'' as they are more generally called. Thus one of the important items in a uniform accounting terminology is given a severe setback.

The term treasury stock (or bonds) should be used only for re-acquired securities; and another title, probably authenticated stock (or bonds) for those securities which have been signed, sealed, and delivered to the proper officer or agent for sale. The term ''authenticated'' describes the conditions and relieves the term ''treasury'' for the more generally accepted meaning it has merited in recent years.

Interest on Customers' Deposits. Amounts paid by a utility to customers as interest on meter deposits in accordance with state laws are chargeable to miscellaneous interest deductions as a main title. (Of course, a utility may keep specific subsidiary accounts which can be grouped under the main title in the financial statements.) If the utilities commission is to protect the people, it would seem that it should require interest on customers' deposits to be maintained and reported as a separate account. It could then determine, as it must now know from experience, that a utility does not pay interest to more than a very small group of the consumers who have meter deposits with the utility companies.

Another point in connection with interest on customers' deposits which may be criticized is its location in the income statement (or account, as it is carelessly designated in the uniform system). Customers' deposits are required on meters, in most cases, to protect the utility from bad-debt losses. Any cost of carrying these deposits, it would seem, should therefore be included in the same division of the income statement as the uncollectible bills. This latter item is included in the part of the statement in which is derived the amount of gross profit from operations, while miscellaneous interest deductions are shown as financial expenses under the heading ''deductions from gross corporate income.'' Furthermore, this latter section of the income statement is intended for items arising because the concern is a corporation, with funded and similar debts, regardless of the type of business it conducts. Interest on meter deposits arises because the concern is operating a utility of the type that requires meters. Therefore, customers' deposits should be shown as an operating cost, rather than a financial cost.

Advances from Affiliated Companies. The system of the National Association of Railway and Utilities Commissioners follows the generally accepted principle with respect to advances from affiliated companies. It provides that non-negotiable notes due affiliated companies shall not be classed as current assets while negotiable notes shall be so classed.

Intangibles. Inasmuch as the title ''intangible fixed capital'' is used in the system as one of the two main divisions of fixed capital, it appears that the commission does not intend that organization expense or franchise cost shall be written off regularly by a utility without specific request from the commission. Very little comment is made on the disposition of the intangible assets. In the description of the accounts themselves, no mention is made of reducing their book value. It is only from a three-line statement under the heading of ''miscellaneous amortization chargeable to income'' that one learns of the possibility of writing down these assets. The lines referred to are:

> This account shall include such amounts as the accounting company may be required to charge to income in amortization of intangible book value or other items carried among its assets.

The title ''good-will'' is not mentioned in the classification of accounts, so far as we have observed, but there is a strong indication that the utility may set up good-will under proper conditions and report it under the general title ''miscellaneous intangible capital,'' the description of which reads as follows:

> This account shall include the cost of patent rights, licenses, privileges, and other intangible property not elsewhere provided for; and all other fixed capital charges which are not specifically assignable to some other account in this classification.
>
> Note: When any corporation desires to reclassify, according to the uniform system of accounts, the book accounts representing its investment in plant and equipment prior to the effective date of this classification, any remainder of the original total book value over the amount determined as properly chargeable to other prescribed accounts (including profit and loss or reserve accounts in cases where it is found that part of the original total book value is property chargeable to such accounts) may be charged to "miscellaneous intangible capital." When such a reclassification is undertaken by the accounting company (and has not been passed upon by the regulatory commission) acceptance by the commission of reports showing the revised balances shall not commit it to the approval of the amounts thus set up.

Contributions for Extensions. Provision is made in the uniform system for having all fixed assets recorded at cost, regardless of the method by which they are obtained. The authors provide for this in the case of extensions of mains or lines that are paid for in whole or in part by customers, municipalities, chambers of commerce, or other organizations. Under such conditions, the full cost of construction is charged just as if the utility were paying for it in full. Then any amounts received from individuals or organizations are credited to "contributions for extensions." This account is carried indefinitely as a type of general reserve.

Appraisals of Fixed Property. Although appraisals are used as a basis of valuation for rate-making purposes, the uniform system does not provide for recording appraisal figures on the books of account. In the general instructions concerning fixed capital appear the following very specific statements concerning this:

> All charges to fixed capital accounts shall be at the actual cost of the property acquired, at the time of its acquisition. A bona-fide contract or agreement of purchase and sale between entirely separate parties shall be prima facie evidence of actual cost. Each item of property shall be carried in the fixed capital accounts at no more, and no less, than its actual cost unless, or until, such property is abandoned, replaced, reconstructed, or converted, when the accounting shall be hereinafter set forth.

Residuals. Accounting for by-products may be accomplished in any of several ways. Accordingly, it is appropriate that the authors of the uniform system designated the specific method to be followed in treating by-products, or residuals, as they are called in the gas business. They prescribe the method which gives production all the benefit arising from the sale of residuals; that is, the production cost is reduced by the proceeds of sales of residuals. In order to have each month's production credited with the approximate value of the residuals produced, whether sold in that month or not, an entry is made monthly charging "stock" account and crediting "residuals produced" with the estimated value of all residuals produced during the month. If the estimate is correct, the stock account will balance when the residuals are all sold. Any difference between the estimated value and the net amount realized from the sale of residuals is adjusted between the two accounts. This throws a slight amount (either debit or credit) into the residuals produced account in a given month which is not applicable to that specific month. The difference, however, would usually be slight.

Any costs incurred in preparing and handling residuals for sale and making deliveries for same are charged to residuals expense account or an appropriately designated subdivision thereof. Both the residuals-produced account, with its credit balance, and the residuals-expense account, with its debit balance, are "included in the financial statements under the general heading, production expenses." Thus, the net profit on residuals reduces the production cost. . . .

A few of the more important options allowed which make the systems more flexible from the point of view of the utilities are enumerated and discussed briefly below:

Uncollectible Bills. A utility is given the privilege of charging uncollectible items to uncollectible bills account from time to time as the accounts are found to be bad, or of charging the account with only an estimated amount from month to month. Under the latter plan, a reserve is created which is charged as debts are found to be uncollectible. The treatment of collections made on accounts previously written off as uncollectible is provided for in a very satisfactory way. Such collections are credited direct to the expense account "uncollectible bills," if no reserve is used; but they are credited to the reserve account when the estimated method of handling uncollectibles is followed. The income tax regulations require a credit to bad debts recovered account under either method of accounting. In my opinion, the uniform system procedure is more reasonable when a reserve is used. The reserve is presumed to be created on a basis of experience over a period of years. This experience is the net loss from bad accounts. Therefore, if the gross loss is charged to the reserve account as debts are written off, the recoveries therefrom should be credited to the reserve account in order to avoid having a debit balance in the reserve account from this cause.

Interest and Dividends Receivable. The utility company is given the option of setting-up a current asset and income account for interest and dividends on securities held by it at the end of an accounting period or of holding such interest and dividends receivable in a suspense account until collected.

Replacement Fund. Provision is made for funding the retirement reserve of a utility, as evidenced by the following sentence under the heading, "replacement fund":

If the accounting company desires, or is required, to segregate in a special fund the assets, or any part of the assets, represented by the retirement reserve, the ledger value of such assets shall be included on the balance-sheet in this account.

Property Abandoned. If a utility abandons property the cost value of which is greater than the retirement reserve created therefor, the excess may be charged to profit and loss or to an account called ''property abandoned.'' The system provides, however, that ''charges to this account shall be made only with the permission of the regulatory commission, and the amount so charged shall be amortized through annual or more frequent charges over a definitely determined period to such accounts as shall be proper.''

Sinking-fund. Another important practice in which the utility is given an option is that of funding its sinking-fund reserves. This opinion naturally would be subject, to some extent, to provisions of trust deeds and bond indentures. Through the several accounts ''sinking-funds appropriations,'' ''income from special funds,'' and ''sinking-fund reserves'' the utility may, as it desires, or as it is required by contract to do, credit interest on sinking fund direct to the reserve or to the income account.

Self-insurance. Any utility that carries its own insurance of any kind in whole or in part may, according to the uniform classification, charge insurance account and credit casualty and insurance reserve. The method of determining the amount of such entry in any case is not described in the classification. Provision is made, also, for entries when a utility carries insurance in a mutual company.

Welfare Work and Pensions. The Association of Railway and Utilities Commissioners apparently observed the trend of the times in making it possible to account readily for welfare work among employees, and pensions for retired employees. Expense accounts are provided for each of these as subdivisions of general and miscellaneous expenses.

Taxes on Net Income. An account bearing the title ''taxes on net income'' is provided and it is so placed in the numbering system and in the income statement that it is the last deduction from incomes before obtaining net income or net loss for the year. This account is to be used ''when such taxes are not allowed by the regulatory commission as revenue deductions in computing the 'fair' return on invested capital, but are considered to be a charge against the stockholders or other owners of the enterprise instead of an expense of the business to be transferred to the public through the prices to be charged for the service which the accounting company renders.'' In other words, the authors of the uniform system recognized that some state commissions might take the view of the Federal Internal Revenue Department that income taxes are a sharing of profits with the government rather than a cost of doing business. If a state commission does consider income taxes as a legitimate element of the cost of doing business, then such taxes are chargeable to an account called ''taxes assignable to gas operations,'' ''taxes assignable to electric operations,'' or similar accounts for other utilities. Under the latter interpretation, income taxes would be included as an expense in calculating, from time to time, the amount which a utility must receive through rates charged to customers in order to meet all expenses of the business.

Penalty Theory of Discount. The following note under the general discussion of ''operating-revenue accounts for gas companies'' shows that a utility may use the penalty theory of cash discount and consider such discount as income in addition to net sales rather than a deduction from a previously entered gross sales figure:

> NOTE A: If a gas corporation desires to credit its revenue accounts upon the basis of net price charged to consumers, it may be allowed to do so upon filing with the regulatory commission a notice of its intention. In such case, all discounts forfeited or penalties charged for delayed payments shall be credited to the revenue accounts involved and kept in such form as to permit their being separately reported.

Free Service. From the point of view of a ready comparison of production costs, one option offered utilities is somewhat unusual. Reference here is made to the option which utilities are given of omitting entirely any charges to its several departments for service rendered by another department. For example, if a gas company uses gas in its production department, or furnishes gas free of charge to a municipality, or to employees in lieu of wages, it may refrain from making any entry for such gas disposed of. On the other hand, it may charge production, franchise requirements, or wages and credit ''duplicate miscellaneous charges.'' The balance of this latter account is treated as one of the deductions from operating expense.

Joint Costs. The question of joint costs in the case of allied utilities under one management is provided for by the following somewhat flexible provision under the heading "joint operating expenses—Cr."

> When any plant or equipment is maintained or operated by the accounting company for the joint benefit of itself and others under an arrangement for apportioning the operating expenses, the portion of such expenses chargeable to others under the arrangement may be credited to this account if it is based on a percentage of the total operating expense or a percentage of the total of some group of primary operating expense accounts or determined in some similar fashion. So far as practicable, joint operating costs should be apportioned by primary accounts, and that part of such cost borne in the first instance by the accounting company, but chargeable to the other party or parties to the joint agreement, should be credited to the primary accounts involved.

Merchandise Department. It is recognized in the uniform system that some utilities might carry the merchandise department merely as a means of encouraging business for the main product, while others might be so located as to make the merchandise department self-supporting. The option offered in this respect to gas companies (which is similar to those offered electric companies) is expressed in the classification under "merchandise and jobbing," as follows:

> NOTE C: If the accounting company sells merchandise or does jobbing work at or below cost for the purpose of inducing greater use of gas, a debit balance in this account, due to such a practice, shall be charged to operating expense account number 771, "new business expenses," or the appropriate subdivision thereof.
>
> NOTE D: If the accounting company is engaged in merchandise or jobbing primarily for direct profit rather than for stimulating the consumption of gas, such merchandising and jobbing may be organized and accounted for as a distinct department of the accounting company, coördinate with the gas department.

As inferred in the opening comments herein, one cannot peruse the uniform systems of accounts adopted by the National Association of Railway and Utilities Commissioners without feeling the benefits to be derived from having such systems in operation, especially for those utilities whose holdings extend into more than one state. Reports indicate that the results already obtained from the use of the new uniform systems are highly satisfactory. Good accounting principles and terminology, except in a few cases, are to be found in them, and undoubtedly they show the result of experience of accounting officers of utilities commissions in handling cases over a long period of years. These systems should play a big part in molding accounting practices and procedures in the United States.

45. Gas and Electric Operating Accounts

GAS UTILITIES *

A. Operating Revenue

Sales of Gas

601. Metered sales to general consumers.
    This includes all revenue from residential, commercial and industrial customers for gas measured through ordinary meters.
602. Flat-rate sales to general consumers.
    This includes all amounts received on a flat-rate basis or any basis not dependent on the quantity of gas supplied.
603. Prepaid gas sales.
    This covers sales made through ''prepayment meters.''
604. Other gas corporations.
    This covers gas wholesaled to other gas utilities who in turn retail it through their own distributive system to their consumers.
605. Municipal street lighting.
606. Miscellaneous municipal sales.

Miscellaneous Revenue

611. Commissions on others' gas.
    This includes revenues for distributing and selling gas of other companies.
612. Rent from Gas appliances.
613. Rent from Property used in operation.
    This includes rents received for the use by others of property devoted to gas operations, such as rent from the joint use of office buildings.
614. Merchandise and Jobbing.
    This account is credited with all revenues from the sale of gas merchandise and from gas jobbing; it is charged with all costs of merchandise sold and costs of jobbing work. The balance represents the net profit on merchandising and jobbing.
615. Miscellaneous Operating Revenues.

B. Operating Expense Accounts

700. Production Expenses.
    This includes about forty accounts covering such items as labor and superintendence, fuel, water-gas oil, coal-gas enricher, purification supplies, works expense, and the maintenance of all gas buildings and equipment. It includes both coal- and water-gas production expense accounts.

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* According to the *Uniform Classification of Accounts for Gas Utilities* of the National Association of Railway and Utilities' Commissioners, November, 1922.

720. Transmission and Distribution Expenses.
This covers the operation and maintenance of the transmission and distribution systems, including labor, supplies, pumping, etc.

730. Street Lighting Expenses.
This includes two accounts, the operation and the maintenance of street lamps.

760. Commercial Expenses.
This includes such items as commercial labor, bookkeeping and contract expenses, meter reading and collecting; commercial supplies and expenses, and agents' commissions.

770. New Business Expenses.
This includes such items as new business salaries, supplies, expenses, demonstrations, advertising, canvassing and soliciting.

780. General and Miscellaneous expenses.
This includes about thirty accounts covering such items as salaries, office supplies, insurance, rentals, retirement expense, injuries and damage, regulatory commission expenses, welfare work, franchise requirements, amortization of franchises, etc.

ELECTRICAL UTILITIES *

A. Operating Revenue

Sales of Current

601. Metered sales to general consumers.
This includes all amounts received from residential, commercial, and industrial purposes for measured electric service.

602. Flat-rate sales to general consumers.
This includes all amounts received on a flat-rate basis or any basis not dependent on the quantity of current supplied.

603. Railroad Corporations.
This includes current sold to such companies for running their cars.

604. Other electrical corporations.
This covers current wholesaled to other companies who in turn retail it over their own lines to consumers.

605. Municipal street lighting.

606. Miscellaneous municipal sales.
This is for energy used other than for street lighting, and includes service to federal, state, or county governments.

Miscellaneous Revenue

611. Commissions on others' electric energy.
This includes all revenues due to transmitting, distributing, and selling current of other companies.

612. Rent from Electric Appliances.

613. Rent from Property used in operation.
This includes rents received for the use by others of property used in operations such as rent from pole attachments, rent from joint use of office building or substations, etc.

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* According to the *Uniform Classification of Accounts for Electrical Utilities*, of the National Association of Railway and Utilities' Commissioners, November, 1922.

614. Merchandise and Jobbing.

The balance of this account represents the net profit on merchandise and jobbing; the debits are all costs of the goods, and the credits are revenues from sales and profit or commissions on wiring and jobbing work.

615. Miscellaneous Operating Revenues.

Includes those items not includible in any of the above.

B. Operating Expenses

700. Production Expenses.

This group includes the operation and maintenance expenses of Steam Power, Hydro-Electric and Gas Generation. The operation expenses under each of these three kinds of generation include the several kinds of labor and superintendence, power plant supplies, fuel, water, lubricants, production supplies and station expense. Maintenance accounts cover the various buildings, generators, engines, equipment, etc.

720. Transmission Expenses.

This group includes superintendence, substation labor, supplies, and expenses; labor and expense on underground conduits, poles, towers and fixtures, overhead and underground conductors; and maintenance of the above and of structures, substation equipment, roads and trails.

730. Distribution Expense.

This covers the operation and maintenance of the distribution system including substation and storage battery labor, supplies and expenses, operation of meters and transformers; and maintenance of structures, substations of various kinds of conduits and distribution lines, and of transformers and meters.

750. Utilization.

These accounts cover operation and maintenance expenses on commercial arc lamps, incandescent lamps, consumers' installations and municipal lamps.

760. Commercial Expenses.

This includes all commercial labor, bookkeeping and contract expenses, meter reading and collecting, commercial supplies and expenses, and agents' commissions.

770. New Business Expenses.

This includes such items as new business salaries, supplies, expenses, demonstrations, advertising, canvassing and soliciting.

780. General and Miscellaneous Expenses.

This includes thirty-three accounts, covering such items as salaries, office supplies, insurance, rentals, retirement expense, injuries and damages, regulatory commission expenses, welfare work, franchise requirements, amortization of franchises, etc.

46. Electric Railways Operating Accounts *

A. Operating Revenue

I. Revenue from Transportation.
- 101. Passenger revenue.
- 102. Baggage revenue.
- 103. Parlor, sleeping, dining and special car revenue.
- 104. Mail revenue.
- 105. Express revenue.
- 106. Milk revenue.
- 107. Freight revenue.
- 108. Switching revenue.
- 109. Miscellaneous transportation revenue.

II. Revenue from Other Railway Operations.

110. Station and car privileges.

This includes revenues from weighing, vending, and other automatic machines at stations; from advertising on cars and at stations; and from news stands, telephone companies, etc., for the privilege of operating at the stations.

111. Parcels' Room Receipts.

This includes revenues from the operation of parcel rooms.

112. Storage.

This includes revenues from storage of freight and baggage.

113. Demurrage.

This is revenue from penalties for delay in loading or unloading cars.

114. Telephone and Telegraph Service.

This includes revenues from commercial telephone and telegraph business transacted by it, when the expense of transacting such business cannot be separated from the expense of conducting the railway service; also revenue for privilege of transacting telephone or telegraph business in offices of the railway company, when the railway furnishes some service of employees whose wages are included in its operating expenses.

115. Rent of Tracks and Facilities.

This includes amounts received as rent for the use of tracks, electric lines, terminals, bridges, and other facilities—when such property is used jointly by this and other railway companies.

116. Rent of Equipment.

This is the gross amount received for use of cars and equipment.

117. Rent of Buildings and other property.

This covers rents for building and property used in operations.

118. Power.

This includes all amounts earned on power sales if the company is not conducting a general power, light, or heat business.

119. Miscellaneous.

This includes all revenues other than transportation, and not includible in the above accounts.

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* From the *Uniform System of Accounts for Electric Railways*, prescribed by the Interstate Commerce Commission, May 1, 1917.

B. Operating Expense Accounts

I. Way and Structures.

This group of twenty-eight accounts covers maintenance of way and structures. It includes such items as superintendence, ballast, ties, rails, paving, track and roadway labor, removal of snow and ice, tunnels, bridges, buildings, fixtures and grounds, etc., etc.

It also includes a separate account for Depreciation of Way and Structures.

II. Equipment.

This group of sixteen accounts covers maintenance of equipment. It includes such items as maintenance of the various types of cars, shop equipment, shop expenses, and a depreciation account for equipment.

III. Power.

This group of eighteen accounts covers the expenses of generating or purchasing the power used to run the railway. It covers cost of maintenance and depreciation on power plant buildings and equipment.

IV. Conducting Transportation.

This group of sixteen accounts covers superintendence and wages of all employees engaged in conducting transportation, car-service and station expenses, etc.

V. Traffic.

This covers superintendence and solicitation, advertising; maintaining and operating parks, resorts, and attractions (to induce travel) and miscellaneous.

VI. General and Miscellaneous.

This group includes eighteen accounts of a general and miscellaneous nature, such as general office salaries and supplies, law expense, insurance, amortization of franchise, rent of track and equipment, etc.

VII. Transportation for Investment—Credit.

This includes credits representing the cost of transporting men and material to be used on new construction when such expenses have been charged to some of the above operating accounts and a part of them should be included as part of the cost of construction.

47. Income Accounts

ELECTRIC, GAS AND WATER UTILITIES *

Income from Operating Properties

1. 401 Operating revenues
2. 402 Operating expenses
3. 403 Uncollectible bills
4. 404 Taxes

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* According to the *Uniform Classification of Accounts for Electric, Gas, and Water Utilities* of the National Association of Railway and Utilities' Commissioners, November, 1922.

5.		Total revenue deductions
6.		Operating income applicable to corporate and leased properties
7.	411	Rent for lease of other electric (water or gas) plant
8.	412	Amortization of limited term rights
9.		Total (Items 7 and 8)
10.	413	Rent accrued from lease of electric plants—Cr
11.		Net rent deduction (credit balance in red)
12.		Balance of income applicable to corporate property

Income from Non-operating Properties

13.	421	Miscellaneous rent revenues
14.	422	Interest on long term debt owned
15.	423	Miscellaneous interest; revenues
16.	424	Dividend Revenues
17.	425	Income from special funds
18.	426	Miscellaneous non-operating revenues
19.		Total (items 13 to 18, inclusive)
20.	427	Non-operating revenue deductions
21.		Total miscellaneous income
22.		Gross corporate income (items 12 and 21)

Deductions from Gross Corporate Income

23.	431	Interest on long term debt
24.	432	Miscellaneous interest deductions
25.	433	Amortization of debt discount and expense
26.	434	Amortization of premium on debt—Cr.
27.	435	Miscellaneous amortization chargeable to income
28.	436	Miscellaneous deductions from gross corporate income
29.		Total deductions from gross corporate income

Disposition of Net Income

31.	441	Sinking Fund Appropriations
32.	442	Dividend Appropriations of net income
33.	443	Miscellaneous appropriations of net income
34.		Total appropriations of net income
35.		Balance transferred to surplus

48. Railway Income Statement

Electric Railways *

I. Operating Income

201. Railway operating revenues..........	$24,000,000	
213. Railway operating expenses..........	16,000,000	
Net revenue (or deficit) railway operations		8,000,000
202. Auxiliary operations—revenues	16,000	
214. Auxiliary operations—expenses	15,000	

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* From the *Uniform System of Accounts for Electric Railways*, prescribed by the Interstate Commerce Commission, May 1, 1917.

Net revenue (or deficit) auxiliary operations		1,000
Net operating revenues (or deficit)		8,001,000
215. Taxes assignable to railway operations		2,000,000
Operating Income (or loss)		6,001,000

II. Non-Operating Income

203. Income from lease of road	54,000	
204. Miscellaneous rent income	20,000	
205. Net income from miscellaneous physical property	800	
206. Dividend income	21,200	
207. Income from funded securities	33,200	
208. Income from unfunded securities and accounts	64,000	
209. Income from sinking fund and other reserves	79,800	
210. Release of premiums on funded debt	36,000	
211. Contributions from others	39,000	
212. Miscellaneous income	27,000	
Total non-operating income		375,000
Gross income (or loss)		6,376,000

III. Deductions from Gross Income

216. Rent for leased roads	133,000	
217. Miscellaneous rents	12,000	
218. Miscellaneous taxes	14,000	
219. Net loss on miscellaneous physical property	2,400,000	
220. Interest on funded debt 221. Interest on unfunded debt	54,000	
222. Amortization of discount on funded debt	167,000	
223. Income transferred to other companies	16,000	
224. Maintenance of organization — Lessor companies	50,000	
225. Miscellaneous debts	300,000	
Total deductions from gross income.		3,146,000
Net income (or loss) transferred to credit (or debit) of Profit and Loss		$3,230,000

49. Income Statement of a Telephone Company *

INCOME AND PROFIT AND LOSS ACCOUNTS IN AN ANNUAL REPORT

I. Operating Income		
300. Telephone Operating Revenues	$234,000	
301. Telephone Operating Expenses	156,500	
Net Telephone Operating Revenues (or deficit)		$77,500
302. Other Operating Revenue	1,200	
303. Other Operating Expenses	700	
Net Revenue—Other Operations		500
Net Operating Revenue		78,000
304. Uncollectible Operating Revenues	1,700	
305. Taxes Assignable to Operations	13,000	
		14,700
Operating Income (or Loss)		63,300
II. Non-Operating Revenues		
310. Rent Revenues from Lease of Telephone Plant	5,225	
311. Miscellaneous Rent Revenues	75	
312. Dividend Revenues	750	
313. Interest Revenues	925	
314. Sinking and Other Reserve Fund Accretions	325	
315. Profits from Operations of Others	505	
316. Miscellaneous Non-Operating Revenue	195	
Total Non-Operating Revenue		8,000
III. Non-Operating Revenue Deductions		
320. Rent Expense	1,000	
321. Miscellaneous Non-Operating Expense	10	
322. Non-Operating Taxes	250	
323. Uncollectible Non-Operating Revenues	40	
Total Non-Operating Revenue Deductions		1,300
Gross Income		70,000
IV. Deductions from Gross Income		
330. Rent Deductions for Lease of Telephone Plant	200	
331. Rent Deductions for Telephone Office	1,400	
332. Rent Deductions for Conduits, Poles, and other Supports	600	

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* From an actual report, name of company withheld.

333. Rent Deductions for Instruments and Equipment	300	
334. Miscellaneous Rent Deductions	275	
335. Interest Deductions for Funded Debt	16,000	
336. Other Interest Deductions	2,000	
337. Loss on Operations of Others	125	
338. Amortization of Debt Discount and Expense	250	
339. Release of Premiums on Debt	100 cr	
340. Amortization of Landed Capital	350	
341. Miscellaneous Deductions from Income	100	
Total Deductions		21,500
Net Income (or Loss)		48,500

V. Disposition of Net Income

350. Appropriation of Income to Sinking and Other Reserve Funds	1,000	
351. Dividend Appropriations of Income	32,000	
352. Appropriations of Income for Construction, Equipment, and Betterments	5,000	
353. Miscellaneous appropriations of income	500	
Total appropriations of net income		38,500
Income balance transferred to credit (or debit) of corporate surplus or deficit account		$ 9,000

Standard Form of Profit and Loss Account

	Dr.	Cr.
Balance at the beginning of the fiscal period		$15,000
Balance transferred from Income Account		9,000
Dividend Appropriations of Surplus	$4,000	
Appropriations to reserves	6,000	
Miscellaneous credits to Profit and Loss		1,000
Miscellaneous debits to Profit and Loss	500	
Balance at end of fiscal period		14,500

50. Balance Sheet Accounts *

ELECTRIC RAILWAYS

Assets and Other Debits

Investments

401. Road and Equipment.
402. Sinking funds.
403. Deposits in lieu of mortgaged property sold.
404. Miscellaneous physical property.

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* According to the *Uniform System of Accounts for Electric Railways* prescribed by the Interstate Commerce Commission, May 1, 1917.

405. Investments in affiliated companies.
    (a) Stocks, (b) Bonds, (c) Notes, (d) Advances.
406. Other Investments—
    (a) Stocks, (b) Bonds, (c) Notes, (d) Advances, (e) Miscellaneous.

Current Assets

407. Cash.
408. Special deposits.
409. Loans and notes receivable.
411. Materials and supplies.
412. Interest, dividends, and rents receivable.
413. Other current assets.

Deferred Assets

414. Insurance and other funds.
    This includes cash or securities set aside in special funds as for depreciation, insurance, pensions, savings, etc.
415. Other deferred assets.

Unadjusted Debits

416. Rents and insurance premiums paid in advance.
417. Discount on capital stock.
418. Discount on funded debt.
419. Property abandoned chargeable to operating expenses.
420. Other unadjusted debits.
421. Securities issued or assumed—unpledged.
    This is the par value of securities owned and held in the treasury, and consists of securities issued by this company, or issued by other companies for which this company has assumed the obligation for payment. It should be subdivided into (1) amount nominally, but not actually issued and (2) amount nominally outstanding.
422. Securities Issued or Assumed—Pledged.
    This includes securities pledged as collateral security for any of its funded debt and short-term loans.

Liabilities and Other Credits

Stock

423. Capital Stock.

Book liability at date	xxxx	
Held by or for carrier at date	xxx	
Actually outstanding at date		xxxx

424. Stock liability for conversion.
425. Premium on capital stock.

Governmental Grants

426. Grants in aid of construction.

Long-Term Debt

427. Funded debt unmatured.

Book liability at date	xxxx	
Held by or for carrier at date	xxx	
Actually outstanding at date		xxxx

428. Receiver's certificates.
429. Non-negotiable debt to affiliated companies.
    (a) Notes ....
    (b) Open accounts ....

Current Liabilities

430. Loans and notes payable.
431. Audited accounts and wages payable.
432. Miscellaneous accounts payable.
433. Matured interest dividends and rents unpaid.
434. Matured funded debt unpaid.
435. Accrued interest-dividends, and rents payable.
436. Other current liabilities.

Deferred Liabilities

437. Liability for provident funds.
    This represents a liability for the amount of assets held for the administration of pensions, savings, relief, etc., funds.
438. Other deferred liabilities.

Unadjusted Credits

439. Tax liability.
    This represents taxes accrued but unpaid.
440. Premium on funded debt.
441. Insurance and Casualty Reserve.
    This is to cover self-carried risks.
442. Operating reserves.
443. Accrued depreciation—Road and equipment.
444. Reserve for amortization of franchises.
445. Accrued depreciation—miscellaneous physical property
446. Other unadjusted credits.

Corporate Surplus

447. Additions to property through surplus.
448. Funded debt retired through surplus.
449. Sinking fund reserves.
450. Miscellaneous fund reserves.
451. Profit and loss—Balance.

51. Some Units of Measurement of Public Utility Operation *

ADEQUACY OF FACILITIES

Railways. The best standard by which to gauge the adequacy of railway service is the ratio of track mileage to population, best expressed in miles of track per 100,000 population served. This figure shows a range, under normal conditions, between 40 and 70 miles. It is usually low in small cities, because riding is limited, and in cities of low-grade or congested population. It tends to increase with population and area up to fairly large cities, after which the congestion in very large cities brings about a noticeable decline. The average of six large cities in England and Scotland is only 18.2 miles.[1]

Another measure of railway facilities is the maximum number of passenger cars in regular operation per 100,000 population, the normal range lying between 70 and 120, the number being affected by factors similar to those just referred to in connection with trackage, but with a wider range because of the comparative simplicity and low cost of providing cars for the traffic offered.

Electric Companies. The best simple measure of the adequacy of an electric supply system to meet the needs of the territory served is its power-station capacity per 1000 of population served. This figure shows quite a wide range due to differences in industrial power requirements. In manufacturing communities such requirements may far exceed the lighting and other comparatively small service which constitute the bulk of the business in many localities lacking industrial activities. Ignoring extreme cases, including those in which the local railways are supplied with power, the range of power-station installed capacity per 1000 population will normally be found between 125 and 250 kilowatts.

Gas Plants. A common measure of gas plant facilities is the miles of main per 1000 population served. This again, is a rather indefinite index of adequacy because of wide differences in population and service density. Industrial and other congested cities will show a much lower figure than high-grade residential communities. The normal range will be found between 1.25 and 2 miles. A unit in terms of miles of equivalent

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* L. R. Nash, *Economics of Public Utilities.* (By permission of McGraw-Hill Book Company), Chap. XIII, pp. 317-321.

[1] *Electric Railway Journal*, September 20, 1924, p. 457.

3-inch main, commonly used in checking up unaccounted-for gas, would provide a more stable comparison because large mains used for congested service would increase the equivalent mileage. The necessary data for such a unit are not ordinarily available, however. Daily capacity of works is a less definite index because of the effect of holder capacity, already refered to. Under normal conditions the daily capacity will be found somewhere between 50,000 and 80,000 feet per 1000 population served.

SERVICE DEVELOPMENT

It is sometimes desirable to distinguish between available facilities and the service which they actually render. The former may be adequate, but the actual service sold may not be on a corresponding scale due to overdevelopment of facilities or underdevelopment of their utilization.

Railways. The best index of urban railway service is the annual car-miles per capita. This figure shows comparatively small, although still substantial variations with size of community served, tending to increase with population. The normal range ordinarily lies between 30 and 50 per unit of population served. Another guide to service development is the car-miles operated per annum per mile of track. This shows much wider variations, increasing rapidly in cities of large population, due to greater density of population and traffic. This figure may be abnormally low or high if the trackage facilities are liberal or scant. It reaches 100,000 miles in some large cities; it is double that amount on the surface lines in New York City; and it drops down to about 25 per cent of that number in quite small cities. Because of this wide variation, the car mileage per capita unit is more satisfactory.

Electric Companies. The best index to the availability of electric service is the ratio of meters to population, expressed by the number of meters per hundred of population served. This number is normally found to lie between 15 and 20 meters, with a pronounced upward tendency towards 25, which may be considered as close to saturation on the assumption of about four persons per family and one meter per customer. The range is influenced by the character of the population as well as the new business activities of the utility. The number of meters in southern cities, where the colored population is comparatively large, is noticeably lower than in other parts of the country.

Gas Plants. The conventional index to gas service development is similar to that above stated for electric companies;

namely, the number of meters per hundred of population served. With normal gas companies this unit lies between 12 and 24, a wider range than with electric companies, and with a number of cities having meters beyond the saturation point suggested for electric meters.

The number of meters per mile of main is a figure often studied by gas experts as a measure of the density of business, which is of particular significance because of the comparatively large investment in the gas distribution systems. The meters per mile of main commonly lie between 100 and 150, but with numerous cases outside these limits, particularly the largest cities, which run much higher. New York has over 600.

Published statistics of both electric and gas companies sometimes give number of customers rather than number of meters. The difference is usually small because comparatively few customers are without meters or have more than one meter each.

PATRONAGE DEVELOPMENT

A still further distinction may be drawn between the service available to existing customers and the extent to which they actually utilize it. An electric company may have liberal capacity and a favorable ratio of meters to population, but may actually sell a relatively small amount of service. . . .

Railways. For electric railways the conventional standard of patronage is the revenue rides per annum per capita, commonly referred to as the "riding habit." This figure also varies widely in communities of different sizes and characteristics. The riding habit in small communities is usually low, but increases rapidly with increase in population.

Engineers who have studied the riding habit in large cities, covering long periods of time, have suggested that this riding habit tends to approach the expression CP^2, C being a constant for a given city and P its population from time to time. This limit could only be reached theoretically under the assumptions that the population remains of uniform density and symmetrically surrounds one central area of business activity; and these conditions never obtain in practice. An approach to the theoretical formula as close as $CP^{1.9}$ has been found in representative cities.[2]

The riding habit ranges from 300 or more in the largest cities down to less than 100 in cities of less than 25,000 population. Where the population served is at least 100,000 the riding habit should normally be above 200, and for 500,000 or more population it should be above 300. There is a tendency to less divergence in these figures due to the increasing inconvenience and delays incident to the use of automobiles in large cities.

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[2] B. J. Arnold, *Providence (R. I.) Report*, 1911, p. 58.

Revenue rides per mile of track per annum are sometimes compiled for statistical purposes but show a very wide range with population served, varying from about 100,000 rides in quite small cities to more than five times that number in the largest cities in which independent rapid transit lines are also operated.

Electric Companies. The logical index of the extent of patronage of electric service is the kilowatt-hours generated per annum per capita. This figure also varies widely with the character of the community, particularly the extent of industrial activities and the sales to other utilities, which are becoming an important factor. The range of kilowatt-hours generated per annum per capita for customary light and power service commonly lies between 250 and 500. The kilowatt-hours sold are from 10 to 20 per cent less, depending upon the efficiencies and complexities of transmission and distribution systems.

A further useful index is the kilowatt-hours generated per annum per kilowatt of station capacity, this giving a measure of the extent of use or load factor, assuming that a normal proportion of reserve capacity exists. This figure normally lies between 2000 and 4000 kilowatt-hours, with a few companies running as high as 6000 kilowatt-hours. Actual load factor, the ratio of actual to possible kilowatt-hours, runs as high as 40 to 50 per cent in well-developed steam plants, but is more apt to lie between 30 and 40 per cent.

Gas Plants. Gas service may similarly be stated in thousands of feet sold per annum per capita in the territory served, the normal range being between 3000 and 6000 feet. It is noticeable that the range is considerably smaller with gas companies than with electric companies, due to the comparatively limited industrial use of gas. This range may be substantially broadened in the future if present plans of gas companies for house heating and industrial service materialize. The gas sales per annum per mile of main are also of interest, although subject to considerable range on account of variations in customer density. The normal range is between 2,500,000 and 4,500,000 feet, except in very lage cities where even double the upper limit is exceeded.

52. A Typical Utility Balance Sheet

ANNUAL REPORT OF A LARGE GAS AND ELECTRIC COMPANY *

Assets

Fixed Capital (This represents the investment in electric generating stations, gas plants, transmission lines, land, and other property used in providing service to customers residing in 286 cities and towns.)		$ 98,429,202.10
Cash (This represents money on deposit in banks.)	$10,330,217.56	
Notes Receivable (This represents the amount of notes given to the Company in the course of its business.)	115,729.42	
Accounts Receivable (This represents the unpaid amount for service furnished and merchandise sold to customers.)	3,313,228.23	
Interest and Dividends Receivable (This represents income accrued to date, but receivable later, on securities owned by the Company.)	11,444.99	
Coal, Oil, and Other Materials (This represents the value of coal stored to insure a continuous supply of electricity and gas, and the value of operating, investment, and merchandise stocks in the Company's storehouses and salesrooms.)	1,552,537.99	
Prepayments (This represents fire and other insurance premiums paid in advance.)	57,819.30	
Miscellaneous Current Assets (This represents the amount of working funds used by cashiers and other employees in the regular performance of their duties.)	22,024.64	
Total Current Assets (This represents the total current assets, so called because they consist of cash or items convertible into cash.)		15,403,002.13
Investment in Public Service Subsidiary Corporation (This represents the investment in the Public Service Subsidiary Corporation which is simply the agent of the Public Service Company of Northern Illinois for the holding and management of certain assets.)	$ 7,230,200.00	

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* The Public Service Company of Northern Illinois, 1926.

Investment in Waukegan Generating Company (This represents the ownership of the Waukegan Generating Company, owner of the large generating station at Waukegan, Illinois.)	8,968,478.58	
Miscellaneous Investments (This represents the investments in companies not controlled by the Public Service Company of Northern Illinois.)	658,355.24	
Sinking Funds (This amount represents cash and securities deposited with trustees in accordance with mortgage requirements.)	305,236.65	
Miscellaneous Special Funds (This represents an amount of $352,377.50 to furnish fire insurance on that part of the property for which the Company carries its own insurance, and an amount of $295,465.50 for service annuities payable to employees who have worked for the Company over a long period of years and have become old in its service.)	647,843.00	
Special Deposits (This represents deposits with trustees to cover the normal income tax on bond interest, etc.)	19,455.44	
Total Miscellaneous Assets (This represents the total assets that are not of a current or a deferred, but of a miscellaneous nature.)		17,829,568.91
Unamortized Debt Discount and Expense (This represents the difference between the par value of bonds and debentures and the amount received from the sale thereof, this difference to be absorbed by deductions from income over the years during which the securities remain outstanding.)	$ 5,376,684.36	
Jobbing Accounts (This represents the cost of special service extensions in progress for new customers, payable to the Company upon completion of the work.)	530,927.89	
Miscellaneous Deferred Debits (This represents the various deferred items not pertaining to current operations, but either chargeable over a period of time or held pending definite disposition.)	971,350.69	
Total Deferred Debits (This represents the total deferred debits.)		6,878,962.94
Reacquired Securities (This represents the securities reacquired by the Company.)		33,900.00
Total Assets (This represents the Company's assets of every nature.)		$138,574,636.08

Liabilities

Capital Stock		
(This represents the amount of capital stock owned by the stockholders of the Company and is classified as follows:)		
Preferred Stock—6 Per Cent	$10,000,000.00	
Preferred Stock—7 Per Cent	6,357,600.00	
Common Stock—With Par Value	12,075,000.00	
Common Stock—Without Par Value (177,821 shares)	17,155,100.00	
Total Capital Stock	$45,587,700.00	
Funded Debt (Mortgage Bonds and Debentures) owned by investors. (The mortgage bonds are secured by the Company's plant, equipment, etc. The debentures represent an indebtedness of the Company and will be paid on Sept. 1, 1931. The different issues of these securities are as follows:)		
Public Service Company of Northern Illinois 5 Per Cent First and Refunding Mortgage Gold Bonds, due October 1, 1956	$18,926,000.00	
Public Service Company of Northern Illinois First Lien and Refunding Mortgage Gold Bonds:		
Series A 5½ Per Cent, due June 1, 1962	22,250,000.00	
Series B 5½ Per Cent, due July 1, 1964	5,000,000.00	
Series C 5 Per Cent, due May 1, 1966	7,500,000.00	
Public Service Company of Northern Illinois Debentures Series of 1926 5 Per Cent, due September 1, 1931	10,000,000.00	
Underlying Bonds (Interest Rate, 5 per cent):		
No. Shore Elec. Co. 1st & Ref. Mtge. due Apr. 1, 1940	1,676,500.00	
Economy Lt. & Pr. Co. 1st Mtge. due Dec. 1, 1956	1,251,000.00	
Citizens Gas Co. of Kankakee 1st Mtge. due Feb. 1, 1932	99,500.00	
Kankakee Gas & Elec. Co. 1st & Ref. Mtge. due Sept. 1, 1930	144,900.00	
Pontiac Lt. & Wtr. Co. 1st Mtge. due July 1, 1927	41,000.00	
Northwestern Gas Lt. & Coke Co. Mtge. due Dec. 1, 1928	1,747,000.00	
Cicero Gas Co. Ref. & Gen'l Mtge. due July 1, 1932	3,365,000.00	
Chicago Heights Gas Co. 1st Mtge. due June 1, 1934	200,000.00	
Total Funded Debt	$72,200,900.00	
Total Capital Liabilities (capital stock, bonds, and debentures outstanding in hands of investors)		$117,788,600.00
Unmatured Liability Under Purchase Contract		422,570.14
Notes Payable. (This represents the amount of notes given for short periods.)	$ 146,000.00	

Accounts Payable (This represents the amount owing by the Company for materials, supplies, etc., and is merely a normal amount similar to that outstanding in any going business.).............	1,582,935.12	
Consumers' Deposits (This represents the amount of money deposited with the Company by its customers for electric line and gas-main extensions, and to insure the payment of service accounts.)......	948,426.64	
Total Current Liabilities (This represents the total current debts of the Company in the process of being paid.)....		2,677,361.76
Taxes Accrued (This represents the amount of taxes accrued for the year 1926, payment of which falls due in 1927.)..	$ 1,690,179.26	
Interest Accrued (This represents the amount of interest on bonds and debentures accrued for the year 1926, payment of which falls due in 1927.)..	828,336.66	
Total Accrued Liabilities (This represents the total of this kind of liabilities as explained above.).................		2,518,515.92
Retirement Reserve (This represents the amount set aside to provide for the replacement of equipment and other property of the Company which wear out or become obsolete.)......................	$ 7,562,338.59	
Insurance Reserve (This represents the reserve set aside for fire insurance which the Company carries on part of its property. That part of the Company's property not covered by this reserve is insured by insurance companies.)..	353,926.42	
Miscellaneous Reserves (This represents the amount set aside for the payment of service annuities to employees, for bad debts, etc.)...	324,333.90	
Total Reserves (This represents the total amount set aside for the specific purposes named above.)........		8,240,598.91
Miscellaneous Unadjusted Credits (This represents the total credits of a miscellaneous nature held in this account pending their definite disposition.)...		717,061.01
Surplus (This is the total amount the company has set aside over a period of years for the protection of its stockholders. Inasmuch as the full profits were not divided, this amount has been allowed to remain in the various assets of the company, and represents an added equity for the stockholders.)		6,209,928.34
Total Liabilities (This represents the Company's indebtedness, reserves and surplus.).....................		$138,574,636.08

CHAPTER IV

ECONOMIC CHARACTERISTICS OF PUBLIC SERVICE INDUSTRIES

53. Natural Monopolies *

Next we take up those monopolies arising from properties inherent in the business, and this gives us the chief class of natural monopolies. We have here the highways of all sorts, but especially railways with their terminal facilities, including the grain elevators and stock-yards; canals; the postoffice; the telegraph lines, the telephones, irrigation-works, harbors; docks; light-houses; ferries; bridges; local rapid-transit agencies; gas-works; urban water-works, electric-light plants, etc.; some of them national, some of them local or municipal monopolies.

One marked distinction must be observed with respect to highways. In the case of all railways—where the transportation is over fixed rails—the monopoly includes all the agencies of transportation, whereas in the case of ordinary public highways, for the use of which toll is charged, the monopoly is restricted to the ownership and management of the highway, and keen competition may exist among its users. The difference is due to technical conditions, for in the case of railways the use must be under unified control, whereas in the case of the public road, the use may be thrown open freely to all the world. Thus it is that the express business over railways is a monopoly, whereas in cities there is keen competition among those who carry small parcels for the general public. . . .

The peculiarities of these monopolies are: First, that the service or commodity makes use of certain peculiarly favored spots or lines of land; secondly, that it is furnished in connection with the plant itself—railway service, for example, cannot be shipped, but must be used in connection with the plant—if it could be shipped as flour can be, then we would have a different result; and thirdly, that the returns are in accordance with the

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* Excerpts from Richard T. Ely, *Monopolies and Trusts* (New York: Macmillan Company, 1912), pp. 59-70.

law of increasing returns—the greater the output, the larger the return.[1] The latter produces an inevitable tendency to monopoly. The cheaper the rate at which an increasing output can be furnished, the greater is the tendency to monopoly, because whenever two competitors unite, they can furnish the service or commodity more cheaply, and consequently there is always a gain; in the case of street-railways, for example, there is a very decided gain, which is the inducement to combination. Men are in business for the sake of gain, and where the law of increasing returns applies to their business, there always stands before them one way in which they can increase their gains. This prospect of additional gain is like a magnet. Ultimately it is found to overcome all other obstacles. Sooner or later it comes about that there is a combination. . . .

Whenever there is a decided and continuous increment in gain resulting from combination, we have a tendency to monopoly which will overcome all obstacles. It is this increment in gain which *is the cause of monopoly.* Now that cause operates when we have to do with businesses which occupy peculiarly favored spots or lines of land, furnishing services or commodities which must be used in connection with the plant. We have, then, one single cause, and the circumstances under which this cause clearly acts are stated; whether it acts beyond these or not is a matter of controversy. Under these circumstances, however, this cause surely does act. . . .

But does the law of increasing returns operate without limit in any one of the kinds of business here under consideration? It has never been proved that such is the case. The law of increasing returns operates up to the point of the full utilization of the existing plant of any one of these businesses, and very often that includes an indefinitely large increase in the quantity of production; but when we go beyond this point, expenses may increase even relatively. Let us suppose that we have a dynamo capable of running four hundred lights and that only two hundred are demanded at a given moment, but that later the demand increases until four hundred are required: in such a case the law of increasing returns holds until the four hundred are demanded; but if the consumption still increases until five hundred are called for, a new dynamo must be procured and expenses may be relatively greater until consumption again approaches the point of full utilization of plant. A street-railway company can do business with decreasing expenses per unit of traffic, until its existing plant is fully utilized; but an enlargement of plant then involves a great outlay, and may increase the expense per unit of traffic. It necessitates a large additional investment of capital to replace occasional switches with double tracks, and to increase correspondingly the supply of power for operation. The expense of the unit of traffic must at first be increased thereby, unless the traffic is at once greatly enlarged. The probability in the case favors a relatively greater expense of carrying on the business for some time, this increase in relative expense gradually diminishing as the point of full utilization is again approached; but by the time this is reached, the relative expense may possibly be lower than it was before the plant was enlarged, although not necessarily so. Great profits come more from a vast business than from the decreased relative expenses.

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[1] It is only just to state in this connection that much credit for this formulation is due to the discussion by Professor Henry C. Adams of the law of increasing returns. Cf. especially his monograph, "The Relation of the State to Industrial Action," in Vol. I of the *Publications of the American Economic Association.* Its date is January, 1887.

Of course, there are those who claim that there is always an increment in gain resulting from combination. That is the socialist point of view, but it is not admitted by the writer. It is admitted that we have an increment in gain under the circumstances which have been mentioned, but not under all circumstances. It is right at this point that controversy arises.

Whenever there is a decided and clearly marked increment in gain resulting from combination, then we have a tendency towards monopoly; but it is maintained by the author that in agriculture, commerce (retail and wholesale), and in manufactures, that cause of monopoly does not obtain. It is claimed, for example, that it is not clear that there would be a decided increment in gain if Marshall Field and Company, and other large retail dealers in the same line in Chicago, or if Altman and Company and John Wanamaker in New York City, should combine. The result would be doubtful, but it is probable that there would not be an increment in gain, but a loss, if they should combine.[2] But when we have a combination of competing gas companies there is no doubt about the result. . . .

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[2] First of all, we observe that these firms do not combine, and do not even seek combination. As their managers are shrewd business men, avowedly seeking gain, the absence of attempted combination suggests that in their opinion nothing would be gained thereby. Each firm has its own facilities and its own customers, and it would be scarcely possible to keep all these under consolidation. Should they combine their resources into a still more gigantic enterprise, the difficulty of unified management would be increased; and how could they prevent new enterprises of magnitude from

It is now generally considered that in all businesses of the kind mentioned there may be discovered a clear movement in the direction of monopoly which is bound ultimately to prevail over all obstacles. If we take them up and examine them one by one, we reach the same result in each case. A thousand efforts to secure competition in the gas business have not given one success as yet; a hundred efforts in England and the United States to secure effective competition in the telegraph business have proved failures. But without examining the thousands of futile efforts to introduce permanent competition into the field of natural monopolies, let us proceed at once to that business which offers the most serious difficulties to the student—namely, the railway business. When it is said that railways offer the most serious difficulties to the student who accepts the proposition that in their ownership and operation they are natural monopolies, reference is made to the student in the United States; for in other countries—like England, France, and Germany—the railways seem to be an unusually clear case. In Germany, a serious effort was made to secure competition, the government owning some of the railways and operating them, and allowing private companies to own and operate others, though under strict supervision. This is a plan which has found advocates in our own country, but it was not successful in Germany. In fact, the difficulties of competition in the railway business between the government and private corporations are so enormous—indeed, insuperable—that either the government or the private corporations must finally abandon the field. If the government service is poor and its competition ineffective, the result is general dissatisfaction. If the government has an excellent administrative system and competes seriously with private companies, it can hardly fail to drive them out of the field, because its resources are so much vaster. Even if the government does not push its superior capacity so far as a private corporation would, but allows its rivals to exist, those who feel its competition keenly will complain bitterly of what they regard as oppressive action on the part of the government which they themselves help to sustain. What might have been foreseen, and undoubtedly was foreseen by deep thinkers, actually happened in Germany. The private lines were purchased, and have since then been operated as a part of the government system. In France and in England, there have been many private companies, and there appears

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springing up? These are a few of the considerations which occur in this connection.

to have been at one time, in both these countries, more or less faith in the possibility of effective competition in the railway business. As a result of industrial evolution, however, in each of these countries there has been a consolidation of all the lines into a few great systems which, in the main, act harmoniously together, pursuing a unified policy with respect to price.

Before turning from these two countries, it may be observed that France offers an illustration of the proposition which was laid down in the discussion of the German experience. There has been a slight attempt at competition through the ownership and operation of lines by the government. The best lines, however, appear to have always been private property, and there is no evidence of any effective, determined competition on the part of the government. The consequence has been dissatisfaction with the government service.

Turning now to our own country, we find that there are some things in the United States which look like really effective competition in the railway business. Nevertheless, it is a fact well known to all who are familiar with this business that the most marked feature of its evolution in our own country has been consolidation.

54. Economic Characteristics of the Utility Services *

There are certain characteristics peculiar to the commodities or services supplied by the utilities, which are distinct from those vended in ordinary commerce. In the first place, the product sold is either a service or a commodity-and-service combined. In the case of steam and electric railways, telephone and telegraph, it is a service, primarily that of transportation, either of goods and persons, or of messages, spoken or written. In water, gas, and electric current, the delivery of the commodity produced is an integral part of its production, and is of a sort which makes a single unified system of distribution by far the most economical. In this respect it differs from meat and bread, soap, clothing or machinery.

Further, the product is consumed locally, in close connection with its distribution. This is true also of irrigation works, for example, which constitute a sort of water works; while canals partake of the nature of railways; and bridges, wharves and docks are parts of the transportation system or terminals.

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* Excerpt from M. L. Cooke, *Public Utility Regulation* (New York: Ronald Press Company, 1924), pp. 16-17.

In the third place, the product is highly standardized. There is less difference between one kilowatt of electric current and another, between a cubic foot of gas consumed in one part of the city and that in another, than between one brand of breakfast food and another, one make of soap and another, one trademarked fabric or piano and another. And so with rail transportation, while it may be a trifle more rapid by one line than by another, those differences tend to become standard, and vice versa, and the entire industry becomes unified and simplified—one in which processes and products are fixed and known. Again, there is little storage possible; there is no holding back for higher prices; the product is consumed almost as fast as produced.

Moreover, it is a cash business, or virtually cash, which the utilities carry on. If bills are not paid promptly, service is shut off. The continuing necessity for the product or service operates to divide the annual sales into monthly units, each of which must be paid for promptly.

While there are certain differences between those utilities which handle both commodities and their distribution (by wire or pipe lines), and those which supply transportation exclusively, these common characteristics distinguish them from the ordinary, competitive products of industry.

55. Economic Characteristics of Public Utilities *

In determining whether an industry is subject to this coercive law, or, in other words, whether it is a public utility, the courts have adopted certain practical tests to aid in making the distinction between a public and a private utility. These tests are generally of an economic character.

The problem arose first in connection with turnpikes. The law here had no difficulty, since the turnpike was simply a highway and that had always been a public utility. In the absence of the franchise grant to private persons to construct the highway and charge tolls, the highway would have been a public facility and free to all users. When bridges began to replace ferries, the charters of bridge companies similarly authorized tolls, the provisions in some cases being that when the tolls had been sufficient to repay, in addition to operating expenses,

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* Excerpts from article by Martin G. Glaeser—"The Meaning of Public Utility—A Sociological Interpretation," *Journal of Land and Public Utility Economics*, I (1925), 176-188.

the entire first cost of the bridge and a designated annual profit, the bridge should become free. Bridge companies were treated as successors to the ferryman. With the coming of the canal and the steam-railway, the same legal principles were brought into play, until it seemed that the common-carrier relation would exhaust all types of services to which this special system of rights and duties might be applied.

The first break in the development came with the telegraph and the gas-light company. At first telegraph companies were treated as carriers. Soon it was perceived, however, that the analogy was misleading. It then appeared that the legal category of public utility might cover many and diverse industries, and hence the various tests of what constitutes a public utility began to appear in the decisions.

The clearest test is the one which bases the classification upon *natural limitations as to a source of supply*. A water company which utilizes the most advantageously situated watershed in gathering its water supply is held by that fact to constitute itself a public utility. Under the same head would fall an irrigation company which impounds the only available stream and the water-power company which utilizes the only available site for a dam. Gas companies drawing their gas supply from natural gas fields are similarly situated.

A second test relates to the *character of the product*. If the character of the product is such that its local distribution facilitates control of the market, we have to do with a public utility product. Thus artificial gas plants and electric plants sell a service which must be taken by customers directly connected with the plants. In view of the difficulties of granting occupation of the streets to competing concerns, the customer is, in effect, dependent upon a single source of supply.

A third test looks to *the scarcity of advantageous sites*, such as sites for union stations and terminal companies, and dock sites for elevators and wharves.

A fourth test emphasizes *limitations of time* as a factor in the situation. Thus innkeepers, cab companies, telephone and telegraph services are held to come within a situation in which their customers, being under the need for urgent service, are placed in a position of dependence.

Another recent test has been based upon the broad ground that where a product or service is supplied under conditions which deter effectual competition from entering the market, the industry should be subjected to the coercion of public utility law. In elaborating these conditions the courts have pointed to the large initial cost of the plant, and to the tendency of costs to decline with increase in business as deterrents to potential competition.

It should be clear that these tests represent a recognition on the part of the judiciary that the conception of the general welfare which underlies the theory of laissez-faire had to be revised. Fair prices, in the sense of competitive prices, were not being realized in practice because a willing buyer was not negotiating with a willing seller. Elements of compulsion were mingled with persuasion. In order to dissolve the element in the situation whereby one individual coerces another, the police power of the state had to be invoked.

The following conditions, therefore, must be realized in order to constitute a given industry a public utility.

1. The economic need which the given industry satisfied must be of a nature that is generally recognized as a common necessity for civilized life. Public opinion is the final arbiter in the selection of such economic needs. The doctrines of ''public use'' and of ''public interest'' are a recognition of the common interest which underlies them both. In a society which is accustomed to look to governmental initiative for the supply of common needs, the facility will be supplied as a public function. On the other hand, a society which is distrustful of the state as an agency for supplying such common needs, and a society in which the forms of associated private activity like corporations have been developed will leave the supplying of such common needs to a private agency under a franchise privilege, not as a matter of common right, but as an agency of the state.

2. All economic activity, in so far as it transcends the immediate economy of the individual and thus becomes a case of production for an open market, has a certain social interest which must not be confused with public interest. All such production of utilities for sale remains a matter of common right, and public interest is satisfied if freedom of choice is maintained. But when, in the course of economic evolution, freedom of choice becomes seriously restricted—that is, when the coercion residing in private property makes itself felt as a monopolistic power—public interest arises in proportion as equality of opportunity to choose is restricted. Private property means exclusive control, but it is defensible only when it results in equality of opportunity to enjoy the benefits of private property. If the

human need supplied is one not recognized as a necessity, restriction of choice will not call forth governmental interference.[1]

If, therefore, the idea of common necessity is at the basis of our idea of public utility, the determination when such a need becomes public must be a matter of collective judgment. Lighting of homes has been such a common need, but did not attain aspects of a public utility until technical progress had developed gas as an illuminant and established it as definitely superior. Freedom of choice between gas and candles existed, but it was a choice between alternatives of which one was generally adjudged inferior. When electric lighting was introduced, the lighting of homes with electricity did not attain aspects of public utility until common consent established its definite superiority. Gas was no longer an effective substitute. Collective judgment, therefore, declared electricity a public utility. Thus the concept of public utility becomes an instrumentality in the *improvement of the standard of life.*

Finally we may say that the recognition of the public utility relationship represents the assertion of a preponderance of public interests over private interests. Since the law recognized certain relatively unchangeable rights and duties, the legal conception of a public utility in the course of time has attained a certain fixity in form and outline. On the other hand, there is nothing fixed about the number and kind of industries that are presumed to be subject to its rules. To borrow an expression from legal literature, it can be said that the conception of a public utility is a fixed concept with a changing content; that is, the industries now recognized as "affected with a public interest" will not necessarily be the industries which the law of the future will classify as public utilities. The industrial and political situation of the time, and particularly the state of public opinion, will determine (a) the number and kind of industries classified as public utilities, (b) the elaboration of the system of rights and duties which make up the institution, (c) the regulating agencies employed, (d) the instrumentalities of regulation (whether rules of law, positive statutes, charters, or special franchises), and (e) the subordinate administrative standards which are applied as a matter of practice. The trend in the development and application of the institution will be a resultant of the weight of social inertia, of the pressure of the economic environment, and of the influence of intellectual progress.

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[1] This treatment has not emphasized the need for regulation arising out of the power of monopoly to exercise price discrimination among its customers. The concept of discrimination will be reserved for separate treatment in a later article relating to price policies.

In conclusion one may ask: What is the practical significance of this conception of a public utility? It is the writer's belief that the dynamic view of public utilities illuminates the entire field of regulation and management. When we regard public utility enterprises as going concerns having relations with consumers, investors, stockholders, and employees that differ appreciably from the corresponding relations of private utilities, we realize that the economic and legal principles applied to private concerns cannot and should not be applied to the same degree to public utilities. In other words, the transactions of public utilities with consumers, investors, stockholders, and even employees are fundamentally of a different order from the same transactions of private utilities. This is clearly recognized when the state establishes a policy of regulation and grants or imposes distinctive rights, duties, or privileges, which place these businesses in a separate sphere of economy.

Practical difficulties arise, however, when in applying this point of view to the details of regulatory policy, courts, administrative officials, and even economists attempt to apply without modification to a regulated economy the principles which may hold true for a competitive economy. When the distinction is made, this point of view will throw a flood of light on the various problems of financing public utilities, their regulation and evaluation. It is of peculiar importance also for an understanding of relations between employers and employees. Without multiplying or detailing illustrations, enough has perhaps been said to show that this dynamic conception of public utilities opens up a realistic approach to the changing problems of this class of enterprises.

56. The Management of Water Works Business *

The management of a water plant is confronted with the engineering problem of furnishing an abundant supply of water for domestic, commercial, and manufacturing purposes. To meet the requirements of each class of customers, it is necessary that the supply be free from water-borne disease germs, turbidity, and mineral content injurious to boilers or manufactured products; that the pressures be adequate and continuous; and that

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* Excerpts, George H. Fenkell, *Journal of the American Water Works Association*, XX (Sept., 1928), 308-315.

the quantity available at every point be sufficient for ordinary as well as for fire prevention purposes. For each endeavor there is a resulting cost, and in the waterworks business these are divided among capital costs, and charges for operation and maintenance. To insure the continued success of the undertaking, it is further necessary that the expenditures under each of these items be made as low as is possible and still comply with the principles of good engineering.

For the purpose of this discussion the business affairs of a water department, therefore, may be divided as follows: (a) the securing of funds at a low interest charge for capital investments, (b) the securing of funds for operation and maintenance, including depreciation, and (c) to meet fixed charges. To these should be added (d) the collection of engineering data and the maintenance of engineering and other records which can be used later as an aid in directing the work of the department.

With the foregoing in mind, it is believed that it is fair to state that the business of a waterworks department consists in securing and disbursing the funds above mentioned and in the ways outlined, and doing this in a manner that will meet the approval of at least a considerable share of the residents of the community.

Personnel. The first essential element in a successful waterworks department is in the employment of a staff of competent workers. The management of a privately operated plant is usually free in the selection of employees, and in the establishment of the salaries that will be paid, but in many municipally operated waterworks but little attention has been given to the qualifications of the applicant when filling a position. Through the operation of a Civil Service department having adequate legal authority, and administered by business men who have had experience in employment affairs, it is possible to remove to a considerable extent the difficulties that prevail when employment is used as reward for political services rendered. The establishment of the Civil Service system, based primarily on the prevention of interference for political or religious reasons in the filling of positions and in making promotions and demotions, marks an important step in promoting efficiency in a municipal water department. The spirit of common devotion will also be improved through the adoption of a system of old age pensions for employees.

A second subject of primary importance is the maintenance of an engineering force that will allow the design for extensions and improvements to be made well in advance of the time that these will be needed in operation. The weakest part of many municipal water projects is the engineering staff that is available for design. When a structure is needed that will require three years to build, with the work carried on in an orderly way, and which can be completed in one year as a rush order, it may be expected that there will be a saving of 25 per cent or more, through the use of more leisurely methods, because the additional time will allow the development of better design, the material can be purchased to better advantage, and labor can be directed in a more economical manner. Even in a well-organized department it may be found impossible to solve each problem that arises in a satisfactory manner, and hence the employment of a consulting engineer or waterworks specialist will not only become desirable but necessary, if the best results are to be obtained. . . .

Charges for Water Service. The principal source of revenue for the municipal waterworks department will come from the sale of water; and the charges for water service may be based on measurement by meters, upon rates based upon the number and type of fixtures used, upon rental value of the property served, or a combination of two or more of these. The use of rental value as a measure in determining charges for water is used but seldom, if at all, in the United States. The use of meters has increased rapidly in the last few years, and while some cities still continue to make collections according to the flat-rate or assessment system, the fact remains that many communities are adopting the meter system as the most equitable for the consumers as well as to the works, and of those that have adopted this method for determining charges, not one, as far as the writer knows, has returned to the flat-rate system after meters have once been placed in use. While the cost of operating a meter system may be as great as one without meters, it will usually be found that through the use of meters capital investments are reduced and water service improved. As the filtration of water increases its cost and its value, the installation of filtration plants tends strongly to bring about the early metering of the services supplied. . . .

There is a great difference in practice in the methods employed in the determination of the water rates in the different cities where meters are used. Some cities charge a uniform rate regardless of whether the quantity furnished is large or small, usually with a minimum charge. When the municipality owns the meters, a meter rental is also frequently charged. Some cities have a variable rate, depending upon the amount of water used by the consumer, and the use of a three-step rate is increasing. Service charges which will cover all or part of the unvarying expenses of water service are coming into more general use, as it is believed that this plan is fundamentally more just to the works and to the consumer.

In addition to the funds that will be secured through the sale of water, additional amounts may be obtained through an assessment against the abutting property for the construction of the distribution mains. . . .

Charges for Municipal Water Uses. In the collection of income tax from employees of municipal plants, the United States Government has assumed that the function of the water department is proprietary rather than governmental. If the Treasury Department is correct in its ruling and the function of such a water department is proprietary, then it should collect from the city it serves its regular charges for all services rendered the municipality. This would include charges for fire service; for water furnished parks, fountains, municipal buildings, for street sprinkling and flushing, and for charitable institutions of all kinds. The department in turn would be expected to pay taxes the same as any private utility. It has been assumed by many that the free service rendered a municipality is offset in the department by freedom from taxation. It should be remembered, however, that there is a difference between the taxpayers and the water consumers, and further, that water service that is rendered free is used with but little attempt to control its use and to reduce its waste. . . .

A well-operated water plant is a great asset to a community for a number of reasons that are apparent and which should be appreciated by the consumers. Its effect in accomplishing a reduction in fire insurance rates, or in maintaining low rates already established, is at present generally intangible. It is to be regretted that the fire insurance companies have not found it convenient to evaluate improvements needed for fire prevention purposes.

Excepting those that have given the subject careful consideration, few realize to what an extent the demand for fire protection service influences the design and cost of a waterworks system.

Experience has shown that the cost of the portion of the waterworks involved by fire protection service in this country generally constitutes from 60 to 80 per cent of the entire cost of the physical property in the case of communities having less than 10,000 population; 30 to 40 per cent in communities of about 50,000 population; 20 to 30 per cent in communities of about 100,000 population; and 10 to 20 per cent in the case of our largest cities.[1]

57. Technology and the Widening Market for Electric Service *

A major problem of industry in general has been the development of the market both intensively and extensively. In the electric light and power industry the solution of this problem is closely associated with the utilization of efficient large-capacity generators and the consequent reduction of unit overhead costs and unit operating costs. Electric utility economics had not been differentiated from general economic principles and the pioneering utility executives were left to find a way out of their difficulties by the method of trial and error. With the heavy investment involved, this procedure required a great deal of courage. A quotation from a utility leader who has followed the industry from its inception is to the point:

> It was not until about 1892 and 1893 that we began to wholesale electric energy. I do not know what others who were in the business then may say, but I confess that I knew nothing at that time about the economics controlling the business. When the General Electric Company was formed, I transferred from the manufacturing to the central station side of the business and took the presidency of the old Chicago Edison Company in 1892. But I knew absolutely nothing about the economics governing the business, and I do not believe anybody else in the country knew anything about it, because every step that any of us took in the direction of wholesaling energy—and there were only a few who did it—drew severe criticism from everybody else in the business and we were told that we were headed for disaster and receiverships.[2]

This bold move toward a wider market was successful and with elaborations is the foundation for the huge output of to-day.

The development of the utility market involves the principle of economic monopoly discrimination which is the principle implied in the quotation from Mr. Insull. Each class of customers is charged as nearly according to ability to pay as practicable. The lower limit to the charge is the direct operating cost incurred in supplying the additional load, although of course an effort is made to recover as much of overhead costs as possible. Under this principle is secured the widest possible exploitation of the market. While application of the principle is theoretically easy by "higgling" with each customer until his ability to pay is found, this method is confined for the most part to small-scale production.[2] A utility might take the time to negotiate an individual contract with each customer, but how may an electric utility confine a customer to the terms of the bargain when control of the time, amount, and maximum demand for the service rests with the customer? Moreover, public policy is against *unfair* discrimination. Scientific differentiation of customers was made possible for the utility after the development of meters such as those for measuring energy consumption, power demand, and power factor. The market requirements of individual electric customers are thus brought under better control by the utility.

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[1] *Manual of Water Works Practice*, p. 593.

* E. O. Malott, *Journal of Land and Public Utility Economics*, IV (1928), 147-156.

[2] Samuel Insull, "Forty-Five Years in the Electric Light and Power Business," an address to the Baltimore Bond Club, 1926.

Electric utilities have a large fixed investment with slow turnover so that the withdrawal of capital is retarded. Thus technological improvement is forced in order to increase efficient utilization of investment. For example, physical integration was undertaken to secure the advantage of high efficiency generation and improved load factor with the resulting lower investment per station capacity and lower production cost per unit of output. Under these conditions the market for electric service is widened and better control of the market in general is secured.

In order to trace the technical advances in the electric utility field which either necessitated or accompanied a widening market, three periods have been roughly marked out from the inception of the central station to the present: (1) establishing a market; (2) developing the market, extensively and intensively; and (3) concentrating the control over the market. These stages (in the evolution of the market for electricity) are partly successive and partly concurrent and a cross-section of the electric light and power market today would reveal the several stages in various portions of the market. For example, farm electrification represents an endeavor to establish a new market.

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[2] In oriental and some European countries, the individual bargaining method is used. Considerable skill in the "art" is exhibited by practitioners but the turnover of goods is necessarily slow. Alexander T. Stewart is said to have started in 1825 the first "one-price" store in the United States. The "one-price" policy saves the time of clerks and the cost of clerks, as less skilled help may be profitably used with the result that more goods are disposed of at lower average expense than under the "higgling" method. Even with competition, identical goods may sell at a higher price at an exclusive store catering to a high class trade than at another store attracting a lower class trade. Or the same store may accomplish the result through "bargain basements." In these cases, differentiation of customers is possible on a large scale. Professional men, such as lawyers, doctors, and consulting engineers, differentiate clients according to ability to pay in rather careful fashion.

In each period improvements in equipment and method seem clearly to have resulted in business policies which later are incorporated in the economics of public service industries, although in some instances business policies have called forth changes in technology. In the history of the electric industry we do not find a single chain of cause and effect from technological advances to changes in business policies. In fact, business practices and technical changes are closely interrelated; sometimes one factor is the cause and sometimes the other. For example, at one stage in the industry's development, technical improvements created unused capacity which directed attention to the problem of developing a market for this unused capacity. The development of this market in turn necessitated new technical improvements which would efficiently increase station capacity. This reciprocal relation between technology and marketing practices will be illustrated in the following analysis. While many important inventions were made during the life of the industry, only a few will be noted to show their effect upon electric utility economics.

Two things are essential to a market—a reliable supply coupled with a reliable demand. When Goebel exhibited his incandescent lamp near the middle of the nineteenth century, it was viewed as a curiosity and nothing happened. Over a quarter of a century later, Edison introduced his now-famous incandescent lamp and violent financial flurries took place. From the time of Goebel to that of Edison, an inexpensive, dependable source of electricity had been made available in the Gramme ring generator. Of course, the Brush arc had been developed a few years previously but the arc lamp was limited to the narrow market of street lighting. Edison's lamp "sub-divided" the brilliant high candle power of the arc into smaller, low candle power lamps suitable for the wider market of commercial lighting. A central station then became economically feasible and three years later the first station to maintain continuous operation was placed in service.

Two kinds of markets may be distinguished: One for lighting, the other for power. The lighting market, except in large cities, is practically a night load, while the power market is substantially a day load. A combination of the two markets is essential to the efficient utilization of the capital invested in the central station. The lighting market was entered by means of Edison's incandescent lamp. Similarly in this early period of establishing a market should be placed, without regard to date of invention, the Gramme direct current motor, the Thomson electric welder, and the successful electric railway [3] developed by Sprague and a host of others, since these applications of electricity opened up the market for power.

Manufacturers frequently find themselves unable to take advantage of a potential market, because freight rates and other distribution expenses raise the cost of the product above the marginal value to the prospective customer. A solution may be found which allows the producer to take advantage first of a narrow portion of the possible market which he may later widen with profit to himself, whenever productive capacity is not otherwise fully utilized and competitive conditions are not adverse. If it were found possible to enter a potential market so advantageously as to exploit it fully, the manufacturer need fear no competition for he may then control his market. This latter condition is discussed under the third period and the former situation is covered in the second period during which the market for electricity was developed first extensively and later intensively.

Markets may be reached by the reduction of distribution cost, by reduction in cost of production, and by reduction in utilization cost to the customer per unit of product. To reach the restricted market area of the first period, the necessity of reducing distribution costs was apparent. The three-wire distribution system independently invented by Edison, Hopkinson and von Siemens saved two-thirds of the copper required to carry the current with reasonable loss and thus cut down investment cost. Even then the market area was seldom over one square mile and the average capacity of generators was 200 to 300 kilowatts with a maximum not exceeding between 500 to 600 kilowatts. Under such conditions an economist viewing the field might truthfully have said that the electric service industry was a restricted market industry of local character much as he refers today to the brick-making industry although the latter industry has comparatively a very much wider market area. Of course, several generating stations could be and often were owned by the same people as are brick plants today but central stations at that time were essentially "local utilities."

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[3] Electric railways started with private generating plants but nearly two decades afterwards began to purchase power from central stations. They are included at this point because of later market significance.

Kilowatt-hours are not bricks and inventors soon found a way around the transportation difficulty. Stanley's transformer made possible the economical transmission of electricity from producer to consumer and thus pushed back the extensive market frontier, as well as accelerated intensive market development. In the transmission of electricity, the large item of loss is that caused by the resistance of the wire to the current. Since resistance is substantially constant, loss may be controlled better by controlling current. But the power which the customer wants is the product of the voltage and the current. A reduction of current at the same voltage in order to reduce transmission loss would correspondingly and arbitrarily establish market limitations. On the other hand, if voltage is increased, the current required for the same power demanded by the customer will be less, transmission loss will be cut down and the market can therefore be widened for a given distribution cost. Objection is immediately made that the product is not in the form desired by the customer. High voltage is dangerous to handle and equipment to utilize it is expensive for the customer. Stanley's solution of this marketing problem—the transformer—was to change the electricity to a high voltage and low current for economical transmission to the customer and then to change the electricity to low voltage and high current for the customer's convenience. Looking backwards, the solution was logical from the standpoint of marketing economics and the economist may point to a somewhat similar solution in the compression of cotton for transmission to market or to Ford's method of shipping automobile parts to centrally located assembling plants. But at that time several leaders in the utility business so opposed the use of high voltage (they called it the "baby-killer") that they are said to have secured the introduction of the electric chair in New York for the "electrocution" of criminals in order to point out its dangerous character.

At first a transformer was placed on the premises of each customer but operating experience soon proved that a "block" transformer serving a group of customers was cheaper, because it incurred less distribution loss in itself and because the investment cost was much less per unit of capacity rating. Moreover, investment cost was further reduced by the use of a transformer of smaller rating than the sum of the ratings of the individual customers served because of diversity of use by customers. The concept of diversity is very important in minimizing overhead cost per unit of service but it was not fully appreciated until technical progress again brought it to the front in the third period.

Reductions in cost of production and in utilization cost to the customer per unit of product were made possible by Tesla's polyphase inventions. Through the use of his inventions economical alternating-current polyphase generators were made and installed with resulting lower cost of producing electricity and the economical alternating-current induction motor was made available for the power requirements of customers. As the area of the market widened with the advance of science, some generating stations became substations, or distributing centers, for the adjacent central station which was equipped for more economical generation, just as in other industries today small factories are often bought by larger, lower-cost producers and used for warehouses from which the local trade may be supplied.

The first substantial lowering in the cost of production came with the introduction of the triple expansion marine engine which was directly connected to the generator. This innovation also lowered the investment cost per station capacity. A margin was made available which could be used to absorb the distribution costs to the market or to lower the price; either would enable an expansion of the market.

Recently an automobile manufacturer offered to replace the cylinder head of earlier models so that old customers might take advantage of the new high compression gasoline. He did this in order to preserve the good-will of customers and to maintain the market for his automobile. Often manufacturers have likewise continued to make parts for discontinued lines or models merely as a market service. Electric utilities were confronted by this problem when cheaper alternating-current generation and transmission systems were adopted. Many customers had direct-current apparatus and, to permit continued utilization of these appliances, the central stations made use of such equipment as motor-generator sets and rotary converters which changed the alternating current to the direct current desired by customers. A market was retained and confidence in the possibility of salvaging obsolescent appliances in the transition gained the good-will of users.

In industrial marketing practice a customer who occasionally gives a large order with few or no orders for considerable intervals of time is usually subordinated to the regular customer who sends in frequent orders, unless the manufacturer's stock of goods is large. The intermittent customer is considered more expensive than the regular customer. To meet this irregular demand, business practices have been developed which differentiate in favor of the regular customer. An electric utility has the same kinds of customers but it lacks the advantages of other manufacturing industries in that a customer fills his own order whenever and for whatever amount he pleases. He is on the same lines as other customers and whether regular or irregular he cannot be differentiated arbitrarily. The irregular customer is a more serious problem in the electric service industry because his order must be manufactured the instant he places it. A large investment in generating equipment is required for this customer and (neglecting diversity) the investment is not utilized for a large part of the time. But until the irregular customer can be singled out, he cannot be made to pay his cost. Consequently, the cost of the irregular customer is distributed over all customers and the resulting higher cost of service restricts the market.

A solution of this problem appeared in the Wright demand meter which registered the high demand of the irregular customer. At about the same time, both Wright and Hopkinson worked out schedules of demand-rates which made the irregular customer pay his way. Through demand meters and schedules of demand-rates customers are scientifically differentiated and fair discrimination is possible. Under these conditions the market was considerably broadened and the experience thus gained led to the elaboration of the principle in the next period.

Economies of large-scale production are well known and need not be discussed. A manufacturer who achieves economical large-scale production may have an advantage over smaller competitors even though they may be situated in the center of a local market. Although the triple expansion marine engine gave comparatively large-scale production for its time, the limit of a reciprocating engine was felt to have been reached at about 5000 or 6000 horsepower. Additional units of maximum rating were installed when further expansion was thought desirable. Under these conditions a limitation was placed upon the economy of large-scale production and the market which could be economically reached.

Then came the turbo-generator and in its wake has followed an ever widening market with the assimilation of distant markets previously dominated by local generating stations. Physical integration was accompanied by financial integration aided by the popular holding company.

The first turbo-generator to be used in this country was rated at 5000 kilowatts[4] and subsequent progress has resulted in very much larger units today. In fact, a recent advertisement of a large electrical equipment manufacturer announced that a unit of 208,000 kilowatts was under construction. Each increase in size has resulted in appreciable saving in production cost, in investment cost per unit of generator capacity, and in investment cost per unit of station capacity. Efficiency of production is so great that the added cost of transmission to more distant markets may be counterbalanced and a kilowatt-hour sold profitably by the distant station at a price below the cost of the small local station. Transmission cost has also fallen with the improvements in equipment and the use of higher voltages. Automatic substations, which have contributed their share toward making possible the extension of the physical area of the electric market, have nevertheless been very important in facilitating the concentration of control over the market.

Inventions such as the tungsten filament lamp, the gas-filled lamp, and a vast amount of electrically operated machinery have increased the efficiency of utilization of the service and correspondingly both widened the market and enabled greater control. To secure the same result with the improved appliances as with the old, the customer does not use as much power and the cost to him is therefore less. If the central station had left the market in that condition, the contraction would eventually have had an adverse effect upon load. In such circumstances the central station has endeavored to extend the service to prospective customers who have previously viewed it as a too expensive luxury, and to maintain or even increase the use of the service by old patrons who have become accustomed to a certain level of service cost. Old customers were encouraged, for example, to adopt a higher standard of lighting for the same cost as that of the old carbon lamp. Better lighting fixtures had to be developed to make the higher standard seem more desirable. Then, too, additional uses for power were found in vacuum cleaners, toasters, grills, and even electric ranges and domestic refrigeration plants. New customers were secured partly on the basis of cost lower than that of competitive illuminants and partly on the basis of better illumination which became a reality after the ductile tungsten filament was produced. Undoubtedly, by this time, the attitude of the public had changed from regarding electric lighting as a luxury to considering it as a necessity. How effective this changed attitude was in extending the market is uncertain, but it unquestionably was a factor of some weight.

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[4] The unit developed about 7500 kilowatts in operation. The difference may be attributed to inexperience and conservatism in rating the new kinds of equipment.

With large generating stations, idle equipment is very expensive and every effort is made to increase the "load factor" which is the ratio of the average load carried to the "peak" or maximum load thrown on the station. To do this, advantage is taken of diversity of use by different classes of customers and rate schedules are prepared so as to build up load at times when otherwise the generators would be only partially utilized. Differentiation is made between such unrestricted users as residence owners whose demands are fairly definite or too small to warrant the cost of measuring; manufacturers, whose demands are inexpensively measurable and whose payments include definite demand charges; restricted users, who are limited to off-peak service, or who furnish a substantially constant twenty four hour load; and a variety of other classes of patrons. In this way the most intensive development of an existing market area is possible. The economy of the larger sizes of turbo-generators forcibly brought customer and rate differentiation to the attention of utility executives over 15 years ago. After the value of differential rate schedules was recognized the electric service industry made rapid progress. Lighting loads of neighboring communities helped to fill in at night on capacity used during the day for the industrial power load of the city. Such practices of taking advantage of diversity of use explain why the combined load factor of one system is nearly 50 per cent, although estimates of utility operators indicate that over two-thirds of the energy that could be sold would have a load factor of only 10 per cent to 35 per cent. Physical integration is partly an endeavor to obtain diversification with the efficiency of large-scale production. Financial integration through holding companies is an effort to secure an improved load factor for an expensive managerial organization.

Increased output of a wider market has led to greater economy of production and a still wider market which in turn leads to a still greater output and so on. What is the limit of the electric service market? Apparently the limit of the market will depend upon the limit to the economy of massed electrical production. Eventually the law of diminishing returns will operate to limit the economic increase in the size of generating units. But where will this point be? Nearly 12 years ago, one progressive utility operator said:

> Probably there is no better time than this to sound a note of warning to those who are carrying the development of prime movers to very large sizes. . . . At the present time (1916) about 35,000 to 40,000 kilowatts is the largest size that can be obtained. I have heard of some orders being given for 50,000 kilowatt machines. I am rather sorry to hear it because I think the buyers will regret it. Before we need the larger size we will need higher boiler pressure, which will require expensive experiments in boiler construction, and we will need a great many changes in the details of apparatus used in connection with large turbine units; and I think that the progress of the next few years will be the better made if it is the slower made.

Ten years later the same operator stated:

> . . . We ordered . . . a few days ago (1926) a turbo-generator—that is an electric generator run by a steam turbine—of about 120,000 horsepower, and in the next few months we shall probably order one that will run up to about 150,000 horsepower.

And this same executive now has under construction a unit of 280,000 horsepower!

On the other hand, the Committee on Power Generation of the American Institute of Electrical Engineers in its 1925 report sounded a warning:

> While there has been a drop from approximately 18,000 B.t.u. per kilowatt-hour to 14,000 B.t.u. per kilowatt-hour in the last 18 months, a further reduction from 14,000 to 10,000 B.t.u. per kilowatt-hour cannot be looked for unless use is made of the mercury vapor-steam cycle, with comparatively high pressure used in connection with the mercury vapor boiler and the most efficient possible layout in connection with the steam end of the station. As far as further reduction in the fuel cost in connection with large steam stations goes, work is being done under the law of diminishing returns. A point has already been reached where further gains are going to be very difficult of attainment.

The quotations are given to emphasize the question: Where will the point of diminishing returns be reached in the size of electrical generating equipment? For a given state of the art, an answer to the question probably would be forthcoming shortly *but the state of the art is constantly changing.* It would be rash to venture a definite guess at this time.

However, the optimism of "superpower"[5] enthusiasts who anticipate the transmission of large blocks of power for great distances is not justified even by a considerable imaginative stretch of the present state of the art. Diminishing returns in transmission are apparent and act as a limitation upon the geographical market area of a single generating plant.

Superpower—less magically named interconnection—is desirable and advantageous in that reserve capacity for overload and breakdown service may be made available by and to adjacent central stations. It is not economically feasible, because of the transmission losses for the most remote station at one end of the network, to transmit power directly to the other end of the network if the distance is very great. Certainly a permanent market for surplus electric power could not be established in the area of the last station nor is the plan contemplated by utility operators.

For emergency purposes when cost must be subordinated to service, transmission of power through the net work is justified. The remote station would then deliver its surplus power to the interconnecting line. Part of the power delivered to the line would be received by the second station which would add its surplus power and send the total through the next link of the network. At the end of the line, that is, at the last station where the emergency is assumed to exist, some amount of power would be switched into the distribution system for the use of customers. The amount of the power received would be less than the total of the amounts delivered by each station because of loss in transmission.

The problem is somewhat like that of collecting gasoline by motor truck from a number of scattered towns to be delivered to a more or less distant market. A large investment would be required in transportation equipment and highways. In addition the motor truck uses part of the gasoline received as it goes from town to town on its way to the market. When the truck gets to the last town, the delivered load of gasoline will be less than the received load by the amount used in hauling the gasoline. The comparison is not exactly in accord with practice but will help to make clear why the distant market cannot be supported by continued transfer of interconnected power.[6]

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[5] Super-power means interconnection of adjacent electric generating companies for the transfer of power from one station to another primarily in emergency, although sometimes disposing of a limited amount of surplus power when no emergency exists.

Giant power is applied to the production of large amounts of electricity in a strategically located generating station. In the case of steam plants, condensing-water requirements are paramount and a location must have an ample water supply. Two other essentials are nearness to the power market and the availability of relatively cheap fuel. While a balance may be struck among the three factors, condensing water and market are controlling because the transportation of coal is less expensive than that of water or of power. There are mine-mouth generating stations on large streams of water, but, at least in one coal field, the coal mines find it more convenient to ship the coal to the utility and to have electric power shipped back than to generate electricity for their own requirements. In the case of hydro-electric plants the principal limitations are market distance, construction cost, and uniformity of water flow.

A prominent utility executive, in an informal address before a recent power conference in the middle west, took the position that the concentration of generating capacity in a few large units is not always desirable and in many cases is decidedly unsound from the point of view of economical continuous service. In his opinion this was especially true when the units have reached a capacity of approximately 50,000 kilowatts each. In other words, when the station has a large power output, several units of equal rating give better control of operation than a single unit having the same total generating capacity. While the economy of operation and investment may be lessened by this practice, as a partial offset a saving is made inasmuch as fewer spare parts are required because they may be made standard and interchangeable. Investment in reserve equipment would also be less for the multiple-unit station, because an accident or repair to one unit does not necessitate throwing a heavy load upon other stations.

Interconnection has made reserves of electrical energy available to the utilities. As a result the concentration of power generation has tended to increase and the pooled reserves are depended upon in case of breakdown or for excess peak-load service. As far as the customer of the utility is concerned, these reserves prevent a stoppage of electric service. If the customer is responsible for a portion of the excess peak-load, the distributing utility may recover its cost in the demand charge. This cost would include the expense of transmitting the required amount of power from the generating stations of the interconnected network. When the utility fails to supply its customers because of breakdown of generating equipment, reliance is again placed upon the interconnected power pool, if the policy has been to concentrate generating capacity in a single large unit. The customers are served as before but the utility may not recover from them the entire cost of the power brought in over the transmission lines. Thus to a utility the use of interconnected reserves for breakdown service is more expensive than for peak-load service. The loss of power in transmission lines represents a larger percentage of the total power sold by the distributing utility when breakdown occurs than when an excess peak is met. This loss is an economic loss even though the utility may recover the out-of-pocket expense in its rates to customers.

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[6] An interconnection from Chicago to Boston was made during the fall of 1926 merely as a test of ability to synchronize generating stations and not to transmit power. The eastern New England end of the test system alone required at Boston from 10,000 to 12,000 kilovolt-amperes for charging current.

Hence, if the generating station of the distributing utility has only a few very large units, the risk of breakdown involves a higher cost of purchased power. On the other hand, a generating station with a number of moderate-sized units does not face so great a risk. If any one unit breaks down, it will represent a smaller portion of total station capacity than would be represented in a station with only large units.

Consequently, the facts give some support to the theory advanced by the executive just mentioned. He has applied his theory in the utility power houses of one of the largest cities in the country. This utility has had reasonable rates and also has been progressive. The contrast of the station having standardized multiple-units to permit flexible operation with the station having several large generating units indicates that single, large units are not entirely displacing the smaller, though probably somewhat less economical, equipment.

In general, to have an economic development of large-capacity power plants at any great distance from the power market either the cost of power production must be relatively low or the market demand for power must be relatively high or both low cost and high demand must be apparent. Under such conditions the transmission cost between source of supply and market will be covered. But the vast water-power resources of the Rocky Mountains are too far from the industrial middle west to be of much aid in the present state of the art.[7]

Technical progress of the electric service utility has been the foundation for the development of the economics of the electric service industry. With a heavy fixed investment the central station has been forced to secure an increase of utilization by widening the market, while the increase of capacity of equipment has brought an economy which allowed a wider market to be reached. The industry has been changed from a few hours' heavy load daily to a heavy load throughout most of the day. Valleys still exist in the load curve but the spur of a perishable production has developed a bold merchandising policy which gradually is smoothing the curve upon a higher level.

58. Some Characteristics of the Demand for Electric Service *

A postulate of this article is . . . that the electric service company deals in and supplies a service and not a commodity.

Electric service is comprised of capacity and energy—producing power and work. Capacity and power are uni-dimensional; work and energy are areas of integrated values resulting from a plotting of the ordinate of capacity or power along the abscissa of time. Load factor is the ratio of the mean ordinate of the integrated area to the maximum capacity ordinate. In practice these ordinates are not taken at instantaneous values but as averages through a predetermined time interval of five, ten, fifteen minutes or an hour.

Capacity factor is the ratio of average use during a given interval of time to maximum capacity available for use.

In simpler language load factor is a relative or comparative value indicating how constantly the maximum amount of power required has been kept at work. To illustrate by a simile of less flexible characteristics than those possessed by electric service, suppose a man has a daily task of hauling a load from one point to another with a hill to be crossed en route. To make the grade at the top of the hill he must use for a brief interval the pulling power of ten horses. When on the level four horses will make sufficient headway and on the down slope the load will almost coast, so that one horse to overcome occasional excess friction will be all that is required. At night they all go to bed. Now that man must maintain his ten horses available for work at the top of the hill; for the rest of the time he can unhitch them or, if more convenient, let them loaf in the harness, but he must have them when he needs them and they must be stabled, groomed, doctored, and fed to keep them alive and fit for pulling every hour of the year. If it be assumed that one horse will be kept pulling full load all the time, three more pulling half of the time, two more pulling a quarter of the time, and the other four only on the sharp grade of the hill, there may be found to be a relationship between oats and hours of actual work, also the life may be shortened, more harness required and other operating costs increased in relation to hours of use. It is thus plain that the cost of transporting the daily load is the sum of a fairly uniform fixed charge plus a variable operating cost, which corresponds to the commonly called demand and energy components of an electric service bill, and it is at once apparent that the more hours all the horses exert their pulling power the lower will be the total average cost of each horsepower hour of work. So, the higher the load factor the lower the average cost per unit of work.

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[7] See article by Walter H. Voskuil, "Water-Power Situation in the United States," *Journal of Land and Public Utility Economics*, I (1925), 100.

* Excerpt from article by G. M. Gadsby, "Use of Electric Service in Industry," *Annals of the American Academy of Political and Social Sciences*, CXVIII (March, 1925), 68-70.

Diversity factor is the ratio of the highest simultaneous use of capacity to the sum of the maximum use of parts of that capacity at different times and locations during a given interval of time. Suppose the farmer has a field near the hill-top, a quarry adjacent to the down slope and a tread-mill along the level stretch. When the load is at the top of the hill he unhitches six horses and they are used first to bring some heavy loads from the quarry, then four are put to plowing, and two on the tread-mill work; later two are taken from plowing and used for miscellaneous hauling jobs, while the tread-mill horses go back on the main load. Summed up, during the day ten horses have done work requiring a total but not simultaneous exertion of twenty-four horsepower. So the diversity factor is $^{10}/_{24}$ths or approximately 0.42 or, as usually rated, each actual horse will take care of demands calling for 2.4 horsepower. The greater the diversity the more valuable each horse becomes and the less becomes the total cost of doing each task.

Power factor is the ratio of real work producing energy to the total apparent energy expended in doing a given task. While the analogy is far from exact, an illustration may be taken from our ten horses. The maximum results from the pulling power of all the horses will be accomplished if they pull in unison with tugs and traces of all the horses taut in parallel lines at right angles to the axles of the wagon. This perfect condition is seldom realized. By swinging out a little the lines of force are exerted at different angles and also the maximum expenditure of power by each horse is not exerted at the same moment, with the result that the sum of individual dynamometer readings on each horse would, if extended over the time interval consumed in hauling the load, amount to more work than that actually required for the movement accomplished. The excess apparent work may be likened to the watt-less component of an electric induction motor load. It is apparent that were it possible exactly to balance the load requirements with the pulling power of the horses, an even ten-horsepower load would actually call for a fraction of an eleventh horse, necessitating the ownership, stabling, care and feeding of an additional horse. So low power factor means added cost both in investment and operating expense and the reflection of this item of expense is to be found to an increasing extent in power schedules.

Here then are the important features of the cost of electric service: Demand and energy components influenced by load factor, diversity factor and power factor, and the greatest of these is load factor!

Our horses, having served their analogical purpose, are now turned out to graze and the terms they were impressed into service to define will be used without restraint.

Load factor may be determined for different periods of time and it is always essential to express the time interval. Daily load factor is of use to determine relationship and diversity value between classes of service; that is, domestic lighting, commercial lighting and small power, street-railway, and large industrial power uses. Weekly load factors taken in relation to daily load factors have significance in showing effect of twenty-four hour industrial operation and the building up of "off peak" loads. Seasonal load factors indicate, when studied in relation to each other, the diversity in character of load supplied—*e.g.* heavy coal-mining loads from middle autumn to late spring and ice-making and refrigeration load—or the lack of it—in summer. Annual load factors have a bearing on generating capacity required and are of greatest interest to the supplying company. Finally, business-cycle load factors have a broad economic interest but must be used on a comparative basis and interpreted only with a knowledge of the character of load supplied. To illustrate, a gaseous shaft mine in normal operation may operate on a load factor of 35 per cent, at half production hoisting three days a week the load factor may drop to 20 per cent, and when producing no coal but necessarily kept ventilated and unwatered the load factor may go to 60 per cent or higher. The composite effect of a coal depression or a strike may therefore be, and has been found in real life to be, an improved system load factor with a greatly reduced system peak demand.

59. Demand Characteristics of the Gas Industry *

If the scientific or theoretically correct rate were applied to each customer's maximum hourly and daily demands, an amount of revenue greater than the necessary return would be received. . . .

The diversity factor is the ratio of the non-coincident maximum demand of the customers to the coincident or actual maximum demand on the system. This applies to both hourly and daily demand.

By non-coincident demand is meant the sum of the individual maximum demands of all of the customers, regardless of the time at which they occur. Coincident demand is the actual maximum demand made on the system.

This factor is very difficult of determination, and yet its existence in the case of certain uses of gas, as well as its absence in certain other uses, is now recognized. One cannot think about the maximum demand on the distribution system made by a customer, without at once realizing that this demand will not coincide in point of time with the maximum demand of every other customer. Indeed, there is no difficulty in recognizing the existence of wide diversity as to the hour or as to the day of the occurrence of maximum momentary demands of customers. Likewise one cannot contemplate the maximum twenty-four hour demand a customer makes without thinking of the diversity of coincidence of his de-

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* Excerpt from Report of Rate Research Committee, *American Gas Association Proceedings* (1926), Appendix I, pp. 112-113.

mand with that of others. They may occur on different days, and at different seasons.

There is diversity of use among customers, first, as to the moment or hour in which their demand is made; then as to the particular twenty-four hour period in which the demand is made, and also as to the season in which the demand is made.

The great diversity among domestic customers is made evident by the very large volumes of gas that are demanded in the hours just before noon on Thanksgiving day. In most communities it is the general custom to cook large dinners on that day and at practically the same hour. Consequently, there is a marked "peak" which does not occur on any other day of the year. The absence of any such peak demand on all other days indicates that on those days the time selected for cooking by individual customers varies over many hours of the day and over many days in the year. . . .

LOAD FACTORS

Load factor, as referred to in the gas business, is the ratio of the actual average demand for gas to the maximum demand.

Load factor must always be referred to two time elements.

1. The whole period of time under consideration (which may be a year).
2. An interval of time during which the maximum use of the facility occurs (which may be a day).

A distinction must be made betwen load factors as referred to Production Plant and Distribution System.

The use of storage holders to take care of hourly variations of send-out makes it possible to operate the production plant at a uniform rate for twenty-four hours. The production plant is, therefore, rated by its daily capacity. Since load factor is an expression to indicate the extent of the use of a facility the load factor of a production plant must be on the basis of daily send-out.

In the distribution system, the capacity of mains and other equipment must be adequate to take care of the instantaneous maximum demand. For convenience this is measured at the hourly rate and the load factor of the distribution system must, therefore, be on the basis of hourly send-out.

The following are the load factors generally used:

Production Plant Load Factor. The production plant load factor is the ratio of the total amount send-out to the maximum daily send-out multiplied by the number of days in the year.

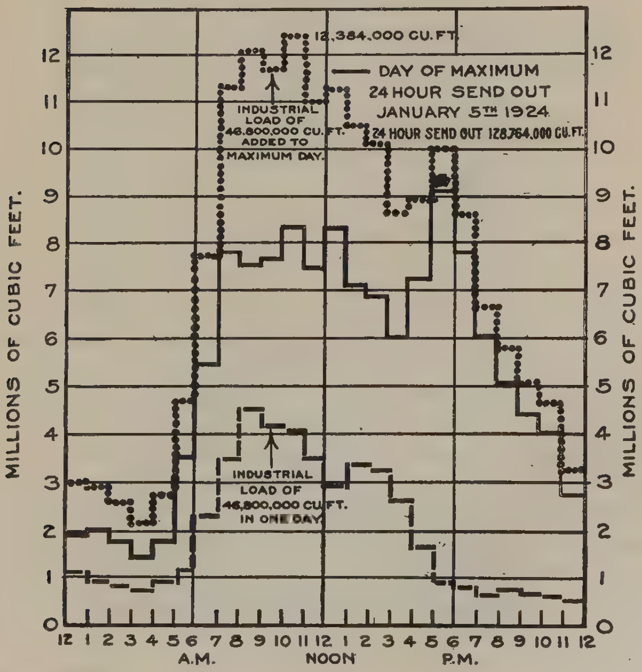
Distribution System Load Factor. The distribution system load factor is the ratio of the total annual send-out to the maximum hourly send-out multiplied by the number of hours in the year.

Customer's Daily Load Factor. The daily load factor of a customer is the ratio of his total annual consumption to his maximum daily demand multiplied by the number of days in the year.

Customer's Hourly Load Factor. The hourly load factor of a customer is the ratio of his total annual consumption to his maximum hourly demand multiplied by the number of hours in the year.

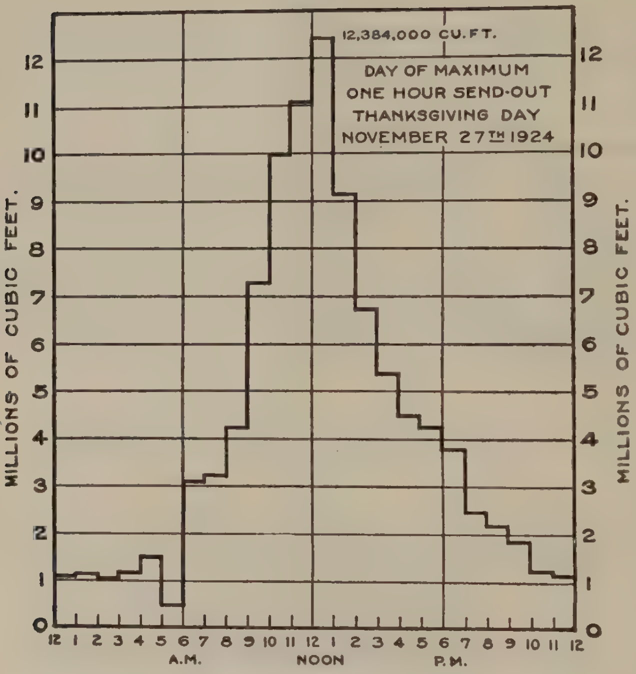
60. Demand Curve of a Large Gas Company

Chart 20



61. Peak Load Curve of a Large Gas Company

Chart 21



62. The Changing Electric Business *

Back in 1907, electrical energy purchased by the elevated railways and surface-car lines of the city was about 55 per cent of the Commonwealth Edison Company's business, and the retail light and power business was about 43 per cent. Energy sold to other companies and wholesale light and power amounted to only about 2 per cent.

This situation, however, has since undergone a radical change. While there has been an enormous increase in the amount of energy used to operate Chicago's transportation systems and to illuminate its homes, the percentages of the company's total business thus allocated have diminished year by year as the application of electricity to industrial processes has continued to expand at an inordinate rate.

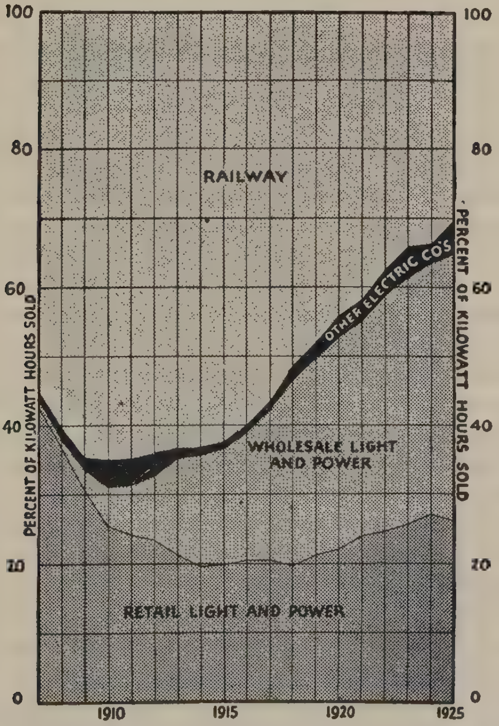
* From *Commonwealth Edison Company Year Book* (Chicago), 1926.

In 1925, retail light and power was 26 per cent, railway power and light 30.1 per cent, while wholesale light and power had mounted to 38.6 per cent of the company's total business. The remaining 5.3 per cent was sold to other electric utilities.

The increasing adaptability of electrical energy to industrial processes has been an important factor in building up the company's large and small power sales. Electricity is rapidly replacing all other agencies in certain heat-treating processes, with the result that every steel foundry in Chicago is now equipped with one or more electric furnaces. During the year, some fifteen or twenty contracts were made with local steel industries, which added more than 27,375 kilowatts of connected load to the company's system. The character of this load, furthermore, is such that 80 per cent of it is off-peak business.

Chart 22 *

THIS CHANGING BUSINESS



* *Commonwealth Edison Company Year Book* (Chicago), 1926.

In addition, many hotels, industrial kitchens, and bake-shops are being completely electrified. For the operation of motors, electric ranges and lights, one large hotel, now in process of erection, will consume on an average, 175,000 kilowatt-hours of Edison energy each month. The power contracted for by hotels alone, in 1925, was upwards of 7500 kilowatts, with more than 5000 kilowatts in lighting requirements.

Twelve large downtown office buildings, which will aggregate requirements of about 4500 kilowatts of energy, were connected during the same period to the company's lines.

Large savings in delivery costs affected by the operation of electric trucks have been responsible for a substantial increase in their employment in Chicago in recent years. Power contracts were made by the company in 1925 with concerns operating more than 215 electric trucks. The thirty-odd trucks purchased by one large milk distributor represent a valuable off-peak power load of approximately 150 kilowatts for charging storage batteries.

63. Telephone Service Characteristics *

A plant so elaborate and extensive as is the telephone plant composing the Bell System requires the greatest care and most effective methods to maintain it constantly at its highest efficiency. This is emphasized in all classes of toll-line connections where there may be hundreds of separate pieces of apparatus in a circuit, a defect in any one of which may destroy a connection; and in the extra long circuits, like the transcontinental line, the highest degree of maintenance is necessary in order to give commercial service at all.

A break in the tracks of a transcontinental railroad immediately affects only the running of trains in a short section near by and may have no effect whatever upon the schedule of trains a thousand miles away. In the case of the transcontinental telephone circuit, however, a break, whether at New York or at San Francisco or at any intermediate point, would disable the entire line from end to end for all through business. . . .

The prerequisite of a telephone service is that it should be a continuous, immediate service; free as possible from any interruptions, and it must be possible for any one in any one place to

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* Excerpts from Theodore N. Vail, "Statement of Policy," American Telephone and Telegraph Company *Annual Report to the Stockholders*, 1916, pp. 39-58; also Walter S. Gifford's statement in *Annual Report*, 1927, pp. 6-8.

get into personal conversational communication with any one in any other place; any other service would be a limited service.

The first essential to an understanding is to realize the peculiarities of the telephone service. There is no other utility or public service in any way analogous. Electric light, gas, water, are from a common supply; your service is obtained by turning a key. Personal transportation is conveyance in a vehicle in common with others running on a schedule between definite points. Transportation of commodities or transmission of message is the forwarding or transmission of the package or message from point to point by the employees of the utility. Each package or message can be forwarded singly or in quantity, and at the convenience of the utility.

The telephone service consists in placing a telephone circuit at the use for personal conversation of parties personally present at distantly separated terminals. To get this service the parties must each be connected with the same system, either through a toll or subscriber's line. It is further unique in that it has no alternate, nothing can take its place. Each circuit is put to the exclusive use of the parties talking and cannot be used for any other telephonic purpose, and the time at which it is used is determined by the convenience of the parties.

The speaking circuit must be a continuous one. The telephone current is a delicate one, a disturbance at any one point putting the whole circuit out of commission, and as only a small part of the connections is between those connected with the same central office and there are relatively few places between which there is sufficient business to maintain special circuits, these circuits must be made up by connecting circuits and parts of circuits passing through the various exchange districts, which necessitates uniformity in the operating methods and the equipment, principal and auxiliary. All employees engaged at terminal or junction points in making up the circuit must work in perfect harmony and coöperation and take their directions from one source; in fact, there must be that absolute coördination of plant, apparatus, employees, and methods that can come only from common interest and common direction. . . .

The original telephone exchange service and the unit of the "Bell System" is the "Exchange District" by which and over which the local service is given without toll charge to every one desiring service within the area comprised in that district. The "Exchange District" is made up of sub-units of central office districts and through the switchboard every subscriber within a given district is connected by subscriber lines. All the central offices in an "Exchange District" are connected with each other by trunk lines. To connect all subscribers in any "Exchange District" with one central office would be a physical impossibility in any considerable district, for the reason that no central office building large enough could be constructed and equipped; the cost of the extra length of wire to carry all to one central office would be prohibitive and the congestion of wires would make it impossible, whereas the number of trunk lines to take care of inter-central office calls is relatively small as compared to the number of subscribers' lines.

For the same reasons "Exchange Districts" or central office districts do not overlap each other, nor do the subscribers' lines of one district extend into the territory of another district. Any party desiring service can be connected with any subscriber, in a distant or even adjoining district, more economically and efficiently through the central office of his own district and thence by trunk lines through the central office of the desired subscriber.

The district-exchange systems are connected with each other by, and form the terminals of, the toll or long-distance lines which are directly connected with their central offices.

Without terminals the toll or long-distance lines would be of little use. To build special terminals would be a substantial duplication of the exchange lines as nearly every subscriber sooner or later, with more or less frequency, desires to connect beyond the exchange district. Connection and close operating relations between the toll and long-distance lines give service between all points on all exchanges, constitute a system, and are the only solution for universal service. . . .

In all kinds of public service, the demand fluctuates according to the hours of the day and the peculiarities of the service. The crowded facilities at certain hours must pay for the operation during slack hours; in other words, the average load must bear the costs of operation.

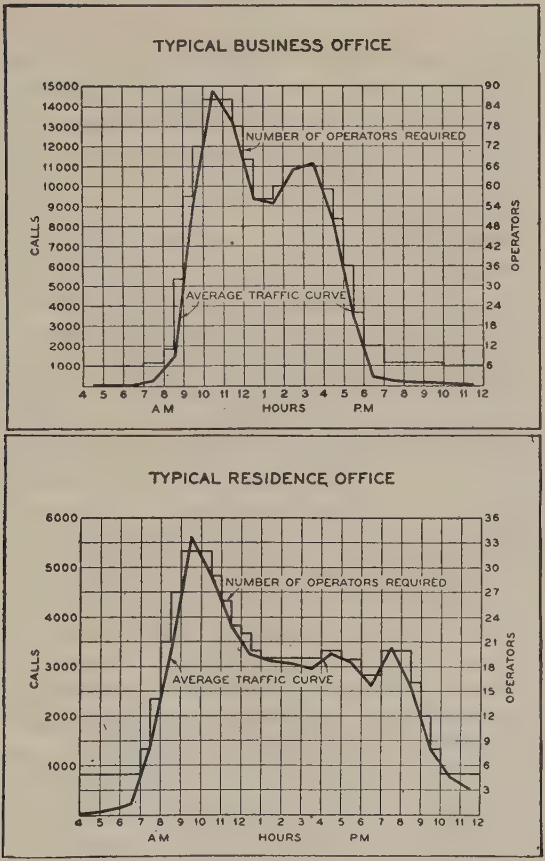
If in any utility some plan can be devised which will create, for the sparse hours, a new traffic and thus increase the average by utilizing facilities otherwise idle, for such service large reductions could be made; but such traffic must not occupy the plant during the busy hours, only during the otherwise idle hours. It must be a new character of traffic, not requiring any addition to either facilities or operating force.

Compare the telegraph and the telephone service. The telegraph business is a very fluctuating one; the equipment and plant must be sufficient to take care of the maximum load.

Telegrams are written communications handed in for transmission by the employees of the company over its lines, and ordinarily require immediate transmission, but with that transmission the sender has no part. For anything not requiring immediate transmission, or which will not bear the expense, the mails and other facilities are open, unless special inducements are offered. Although the operating force is adjusted as far as possible to the fluctuating load, the facilities cannot be and there

Chart 23

TELEPHONE SERVICE CURVES



are therefore many hours of idle facilities and some of idle force. There are in correspondence all sorts of communication, the imperatively urgent, the urgent, and that in which a few hours make little difference. Deferred and night messages, day and night letters, at special rates create a new business, which can be deferred and dispatched at the convenience of the company at a time when immediate business does not demand the facilities.

A telephone connection is for a personal communication between two people personally present at the terminals of the talking circuits. The service, as given by the Bell System, is as nearly immediate as is physically possible. It is a service which must meet the convenience of those wanting the service, not the convenience of the Company. The calls for service are made during the active hours of the day and come in the most varying fluctuation frequency during those hours.

If by some way not yet devised, there could be a telephone business developed which would be a waiting business to utilize these otherwise idle intervals, a much higher efficiency could be got from force and facilities and a lower price for that business might be made, but people do not want to attend at hours unseasonable to their personal convenience or comfort, nor could the parties wanted be found, for the unseasonable hours are the hours of recreation, rest, and sleep and unfortunately the unseasonable hours for the public are the idle hours of the telephone system. If a deferred service could be spread over these idle hours a lower price would be possible. Such a business would have to be a waiting business and, although the conversation might stand the waiting, the parties necessary to the conversation would not. . . .

In ordinary industrials and in transportation, there is great elasticity; increased output or capacity can be obtained by overtime, twenty-four hour days, and by crowding the facilities. As is well known, there is no elasticity to a telephone circuit. The demands for service come at certain hours which are fixed by the social and business habits of the public; by the times when the individual can be personally present and can reasonably expect to locate the distant party desired. Each circuit is, while being used, exclusive to the user, and can be used for no other telephone service. If there are parties waiting to take the circuit immediately following its release, the maximum service of the line can be obtained. If there are no parties waiting, then the interval between the demands is lost. The demand fluctuates hourly from a high peak of load during a few of the busy hours of the day to the very small demand during the recreation hours, and hardly any demand during the sleeping hours. This makes the service load of any telephone system a very low average. This average load will always be greatly increased when there is enough congestion to make the service a slightly deferred service; deferred sufficiently to fill partially some of the non-busy intervals, but not enough to discourage traffic.

64. Peculiarities of Street-Railways as an Utility *

In considering the application of general discussions of utility problems to electric railway service, it becomes obvious first that here is a service-type utility and not a product dispenser. The service of most roads has the pioneer-day feature that all the customers are put in one big class and all charged a single flat-rate fare, though there is an evident desire to break away from this by the use of several small-fare zones which serve to classify customers by length of journey. It has apparently been considered to be of little or no use to cultivate off-peak classes by special rates which might be permissible—since the service is such an intimately personal matter that the equity of such discrimination between persons and classes would not be recognized and the differences would be resented. Moreover, the people who seek preferential treatment—like workingmen's tickets—seek it on social grounds unrelated to the railway business, and for peak-load periods when oftentimes the real cost of added facilities rises faster than the added income at full rates.

The load factor on city lines is perhaps the lowest of all the public utilities—about 33 per cent of the traffic is handled in four hours of each day. This arises of course from the desire of workers to travel morning and night—or morning, noon and night. Sharp peak loads are produced by such a concentration of traffic, and it is short-hour concentration which excuses strap-hangers—for it may be a physical impossibility to operate cars enough to give seats for all who attempt to board at once. In many cases—possibly in most—to order a company to furnish rush-hour cars up to the absolute limit of ability to run them over a given line may cause unremunerative operation.

Obviously various data can be used in comparing the concentration of traffic on one line with another, and in one hour or

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* Excerpt from H. C. Barker, *Public Utility Rates*. (By permission of McGraw-Hill Book Company, Inc.), pp. 215-217.

another; the "concentration factor" employed by the Fare Research Bureau of the American Electric Railway Association is the ratio of number of passengers who would be carried in twenty-four hours at maximum peak figures to the actual number in twenty-four hours.

What is called "diversity-factor" in other utilities does not enter electric railway operation as such, for a person either rides or does not ride; there is no quarter or half load so far as one customer is concerned. There is used, however, a figure which is indeed called "diversity factor" and it needs to be carefully distinguished from the diversity factor of other utilities. The street-railways' diversity factor (according to the use of the American Electric Railway Association Fare Research Bureau) shows the difference of traffic carried by consecutive cars over a given line in a definite interval. Numerically it is the percentage ratio of average number of passengers per car to maximum for the period and place selected.

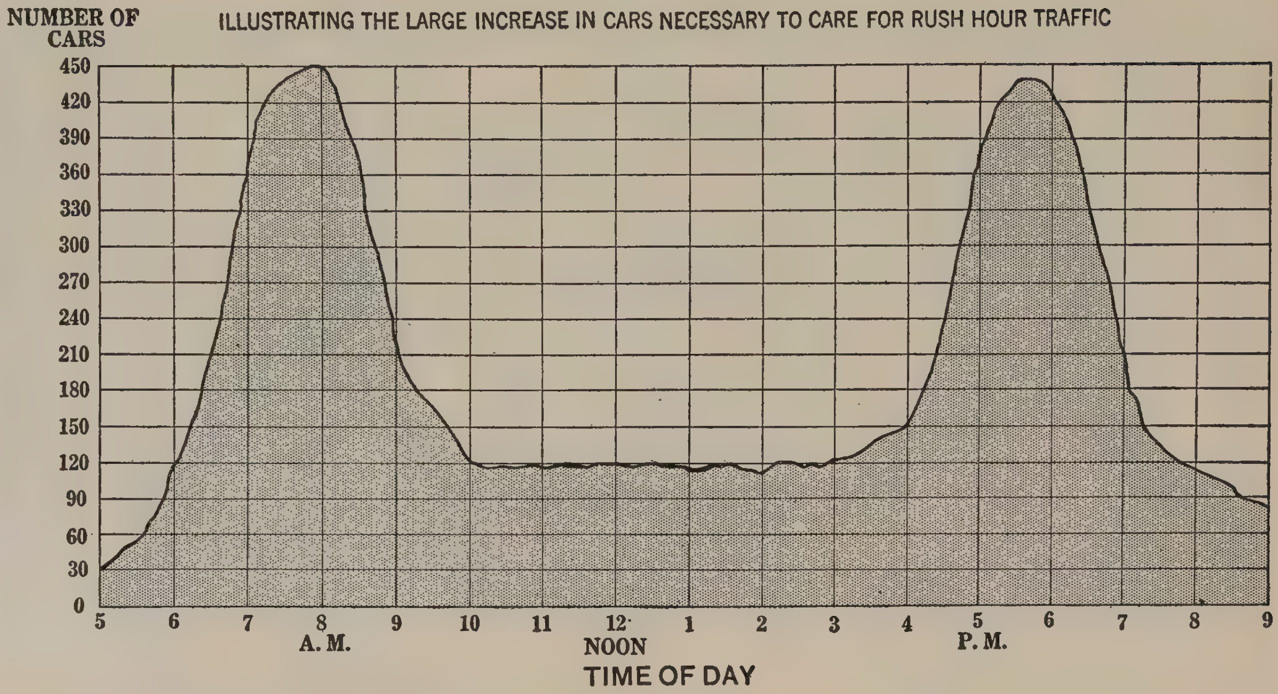
The costs of operation in different cities, expressed for the units most nearly comparable, like car-hours, car-miles, passengers, passenger-miles, etc., have been found to vary extraordinarily even when each company under discussion is operating as efficiently and satisfactorily as possible under its local conditions. This simply means that even after giving consideration to the usual evident conditions there remain so many variables undisclosed that direct unweighted comparisons are untrustworthy. In many cases certain units of operation may, on careful scrutiny, be valid bases of study; but these same units may lead to wild results in other cases. Each case is to be judged largely by itself in ascertaining proper and reasonable fares—or, better expressed for most cases, the limitations to be placed on travel for a single fixed common fare.

The commonly seen units on which roads have been compared are, for example, operating and fixed cost per passenger, per track-mile, per car-mile and per car-hour. Each may be of use at times but they should not be held up as universal indices. Number of passengers alone gives unreliable results since the length of travel varies from place to place, line to line, season to season, and hour to hour. Passenger-miles come nearer to wide application but again here curves, grades, schedules, and peak loads materially alter the showing. Moreover, the length of a passenger's trip is not easily ascertained, special counts having to be made over typical periods and the results taken as applying to continuous operation.

65. Car Service Diagram for Typical City Electric Railway *

Chart 24

ILLUSTRATING THE LARGE INCREASE IN CARS NECESSARY TO CARE FOR RUSH HOUR TRAFFIC



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* *Illinois Public Utility Commission Bulletin.*

66. Changing Characteristics of a Metropolitan Rapid Transit Service *

While the total number of passengers carried on the Boston Elevated system increased from 352,469,586 in 1915 to 366,938,908 in 1927 (reaching a maximum in 1917 of 381,017,338) this does not tell the real story of the volume of business. The interesting thing about it is the change in the character of riding.

On this property, pleasure riding has practically ceased. Business riding has apparently increased. The automobile has taken passengers away on Sundays and holidays and in the summer months. The summer vacation has become prevalent in practically all industries.

The figures of revenue passengers carried indicate this:

TABLE 15

Average Weekday Passengers (Saturday and Sunday Excluded)

	1917	1926	1927	1928
Year	1,073,943	1,086,544	1,079,087	
Aug.	1,002,474	911,098	900,696	
Dec.	1,127,067	1,238,356	1,163,758	
Jan.	1,106,457	1,151,773	1,187,824	1,163,263

Average Sunday Passengers

1917	1926	1927
728,847	576,701	555,326

Average Holiday Passengers

1917	1926	1927
857,902	666,258	661,840

The increased use of rapid-transit facilities on business days is also indicated by other traffic statistics. Count of passengers at Kendall Square Station on the Cambridge subway, taken on the following dates, indicates this:

April 1, 1918 (Monday)	144,256
March 30, 1927 (Wednesday)	163,462
March 14, 1928 (Wednesday)	151,920

The following figures show the increase in passengers entering Harvard Square Station of the Cambridge Subway:

1922	1926	1927
15,713,051	18,092,459	18,139,260

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* Boston Elevated Railway, "Changing Characteristics of 'El' Service." *Coöperation*, April, 1928, pp. 56-58.

Chart 25

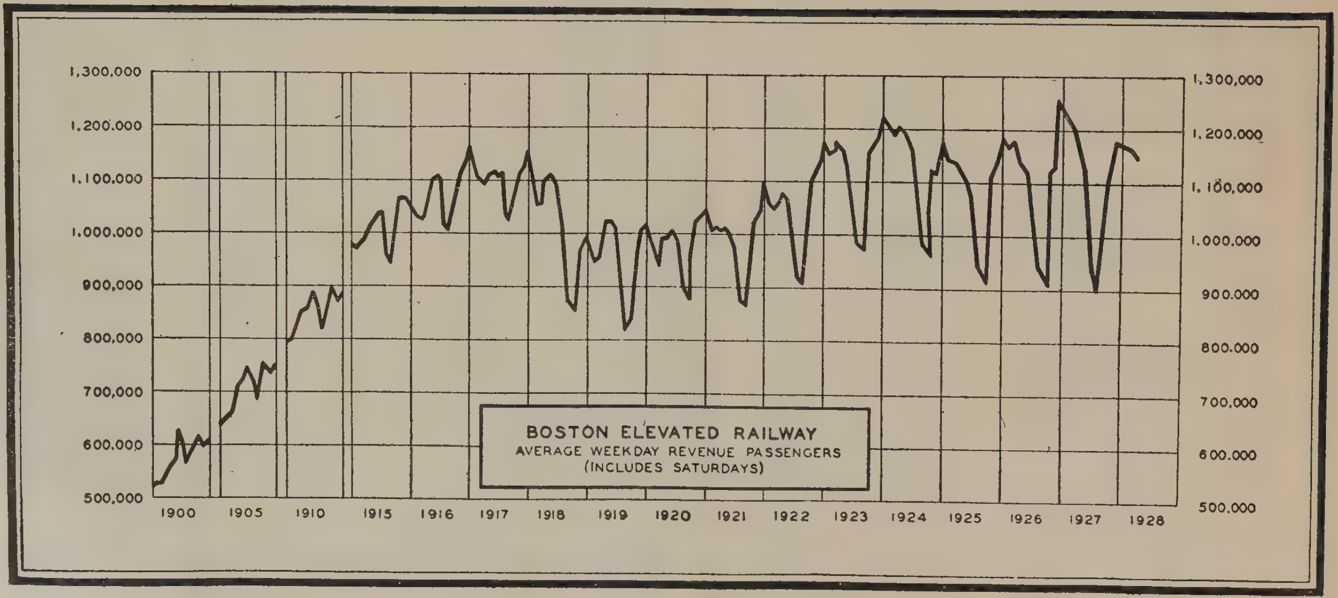

BOSTON ELEVATED RAILWAY
AVERAGE WEEKDAY REVENUE PASSENGERS
(INCLUDES SATURDAYS)
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
1900
1905
1910
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928

TABLE 16

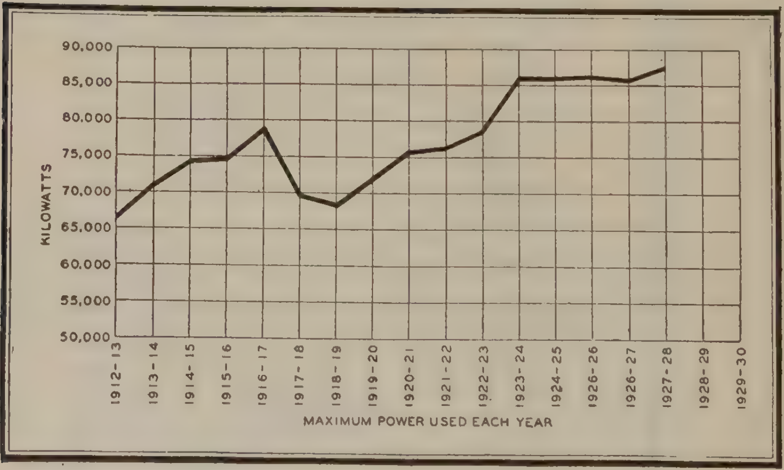
PASSENGERS CARRIED IN WINTER AND SUMMER MONTHS

MONTH OF	1916	1917	1926	1927
January	29,993,264	32,432,168	33,144,528	34,160,787
June	31,163,211	31,943,366	29,831,144	29,167,572
July	30,107,539	31,517,011	27,160,300	26,167,466
August	30,193,058	30,999,846	26,381,206	26,274,417
December	34,029,260	32,839,394	35,474,895	33,644,529
For Year	373,577,908	381,017,338	371,218,401	363,938,908

The figures in the table at the top of this page show the increase in the winter and decrease in summer riding, but being for the entire months do not show the effects of decrease in Sunday and holiday riding nor increase in week-day riding.

Since 1917 not only has there been a change in character of riding, as between business days and holidays and as between winter and summer, but, also there has been an accentuation of the peak hour of the day. This is but another example of the fact that the railway service is becoming more and more a business service. Its main and primary function is taking people to work in the morning and home at night.

Chart 26—Maximum Power Used Each Year—Boston Elevated Railway



67. Overhead Costs in Public Utilities *

What are "overhead costs"? The term is nowadays much used and variously defined; in fact, it covers an entire family of ideas, but they have one essential thing in common. They refer to costs that cannot be traced home and attributed to particular units of business in the same direct and obvious way in which, for example, leather can be traced to the shoes that are made from it. And most of the real problems involve one other fact; namely, that an increase or decrease in output does not involve a proportionate increase or decrease in cost. There is a deal of complexity in the attempts that are made to trace the untraceable costs or to assign them on some rational basis, or to discover the true added costs of added business, but at the bottom of most of these complexities lies a fact that is simple. That fact is unused productive capacity, or capacity of which full advantage is not taken. "Idle overhead," that great industrial sin, is simply the expense side of this unused capacity. . . .

Overhead Costs on Railroads. . . . But it was the railroad itself that first brought the notion of overhead costs into real prominence with economists. When railroads were new, their rates were commonly uniform or nearly so, based on weight and distance, and were uniformly high. Soon it was discovered that additional traffic could be carried at little or no additional cost and that reduced rates, if confined to classes of traffic not already moving, would increase the net earnings of the company. Thus classification was born and the foundations were laid for cheaper railroad carriage than would ever have been possible without discrimination.

Along with it or after it, however, came many other less innocuous types of discrimination, often without rhyme or reason, and harmful even to the roads that used them. Rate wars and receiverships followed. Shippers at local points saw goods hauled past them to junctions beyond at lower rates than they paid for their shorter hauls, and with simple logic reasoned that if the lower through rate was adequate, the higher local rate was obviously extortionate. Under pressure of contending interests, with the need of justifying practices against attack, the theory underlying discrimination became vocal and explicit, and the world learned that railroads were different from other industries because such a large part of their costs were ''constant'' or independent of traffic.

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* Excerpts from J. M. Clark, *The Economics of Overhead Costs* (Chicago: The University of Chicago Press, 1923), pp. 1, 9-12, 318-323.

Thus the world of economic thought was made aware of a fact which is older than railroads, older than economic science and, far from being a peculiarity of one business or of a group of highly capitalistic businesses, is universal. From the present point of view the thing that seems more in need of explanation is why economists should have thought that other industries were different from railroads or why they should have thought that they had explained the prices of single goods by showing that they tended, under competition, to cover the expenses of production.

So far as railroads were concerned, the chief use made of the notion of overhead costs was to justify discrimination as a general practice, on the ground that added traffic was not responsible for those costs which did not increase as traffic increased, and that in any case it was impossible to determine the proper share of costs traceable to one shipment or one unit of business.[1] Some attempts were made to estimate in figures the relation between traffic and cost; the question being framed in the form: ''What percentage of railroad expenses are constant and what percentage variable?'' The common conclusion was that about half the operating expenses were variable and everything else, including taxes and all return on capital, was constant.[2] As for the fact that increased traffic demanded increased investment of capital in equipment of all sorts, this was recognized in varying degree by different writers, but was never thoroughly harmonized with the formula of constant and variable cost. The upshot was that the makers of rates were assumed to know their own interests, and while it was clear that no one in or out of the railroad business knew the ''variable cost'' of any given class of traffic, it was assumed that the facts of cost justified wide discriminations, and the practice of ''charging what the traffic will bear'' was given the benefit of the doubt so far as cost was concerned. The question of distinguishing fair from unfair discrimination was left to be argued on other grounds.

Overhead Costs in Other Industries. It soon became evident that railroads were not the only industry using large fixed capital and subject to the ''peculiarities'' of constant and variable costs. It also became evident that discrimination was not the only untoward result of such a condition. Rate wars on the railroads often abolished the regular classifications and brought all rates to a level far below cost. Large companies, railroad and industrial, failed, were re-organized, and continued in business, often more formidable competitors than before. It became evident that economic law did not insure prices that would yield "normal" returns on invested capital, because the capital could not get out if it wanted to, and so had to take whatever it could get. The business cycle had become a recognized part of the order of things, with its recurring periods of excess producing capacity, during which active competition tended to lower prices until even efficient concerns could make little or no return on their investment. "Cut-throat competition" was seen to be a natural thing, and it was seen to be equally natural that business should adopt protective measures, whether combinations, pools, gentlemen's agreements, or a mere sentiment against "spoiling the market."[3]

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[1] On the other hand, as early as 1850 Dionysius Lardner in his *Railway Economy* worked out an elaborate system of allocating overhead costs.

[2] Cf., Wm. Z. Ripley, *Railroads: Rates and Regulation* (New York: Longmans, Green and Co., 1921), Chap. ii.

A. T. Hadley expressed these tendencies with remarkable compactness in the following passage:

> The investment of fixed capital described in the preceding chapter has wrought much more radical changes in manufactures and transportation than in agriculture. . . .
>
> Each producer can extend his output with a gain rather than a loss in economy. If he can increase his sales, there will be only a slight increase—perhaps none at all—in the expense for wages and materials, and a decided decrease in the share of the charges on fixed capital which each unit of product must pay. There is no fixed standard of cost which we can treat as the normal price; for the cost per unit of product depends on the quantity sold, falling as sales increase.
>
> The price which will induce new competitors to enter the field is also much higher than that which will lead old ones to withdraw. No concern will quit competition as long as it can pay an appreciable part of its interest charges. It is better to lose part of your interest on every piece of goods you sell than to lose the whole of it on every piece you do not sell. As long as the price received more than covers the expense of wages and materials, each of the old factories will continue to compete. Even if it changes ownership by foreclosure it will remain in operation. But, on the other hand, no new competitor will be called into being unless the price is high enough to afford a liberal profit, after paying interest, maintenance, and other charges on fixed capital invested under modern methods. Thus prices, instead of constantly tending to gravitate toward an equitable figure, oscillate between two

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[3] Alfred Marshall, *Principles of Economics* (London: Macmillan and Co., Ltd., 6th ed., 1910), p. 375.

> extremes. The rate of production, at figures which give a fair profit, is usually either much larger than the rate of consumption, or much smaller. In the former case, prices are unremunerative and unjust to the producer; in the latter case, they are oppressive to the consumer. The average price resulting from such fluctuations may perhaps be a fair one; but the wide changes of price are disastrous to all parties concerned.
>
> . . . In some cases the industrial units which are necessary for proper utilization of labor have become so large as to produce actual monopoly. . . . Even in cases where the necessity for concentrated management is not quite so marked, . . . the competition of different concerns always involves a loss, from the need of maintaining too many selling agencies, the expense of unnecessary advertising, and the lack of proper utilization of fixed capital.[4]

Public Utilities. The term "Public Utilities" is commonly applied to companies furnishing a community with such things as water, gas, electric current, or telephone service. Street-car lines are also included, but will not be discussed here. These services exhibit all the problems of overhead cost, and in extreme forms. They have large capital investments, of a highly specialized kind; they show marked economy with size (except for telephone companies) and with intensive exploitation of their localities; they have strongly marked daily and seasonal peaks and some of them have developed definite policies looking toward minimizing the wastes involved; and they face difficult questions in allocating their overhead costs to different types and classes of business. In the sale of electric current, in particular, there have been developed the most systematic mathematical methods found anywhere for differentiating charges according to factors affecting the company's peak load. These systems of rates involve principles deserving of serious study by other businesses with a view of adapting them to their own peak-load problems.

The causes of increased efficiency with increased size in the supply of electric current are admirably summarized by Paul M. Lincoln, who groups them under three main heads.[5] First is the fact that larger units of equipment cost less per unit of capacity; second is the reduction of operating expenses; and third is the fact that the greater the number of customers the more do their individual irregularities neutralize each other, producing a better load factor for the plant as a whole than the average of the individual load factors, and a better load factor for a large plant than for a small one. Over against these savings stand the elements of increasing cost in the distributing system, and increasing losses in transmission. The reduction of operating expenses is partly due to the fact that larger output makes it economical to install more and more labor-saving devices, and in order to secure these gains investment must increase more than would be necessary merely to reproduce on a large scale the identical mechanical units and the identical physical services rendered by smaller plants. And as a further result, operating expenses per unit produced diminish even more than investment.

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[4] A. T. Hadley, *Economics* (New York: G. P. Putnam's Sons, 1896), pp. 151-54.

[5] *Proceedings of the American Institute of Electrical Engineers*, 1913, pp. 1937-43. In Mr. Lincoln's address as president of the Institute, two years later, he discussed growth in size of plants, among other features of electrical development.

The economies of larger units—boilers, generators, and transformers—Mr. Lincoln represents by straight lines sloping downward on a double logarithmic scale. Translated into a natural scale, and into terms of total cost, these become curves ascending at an ever diminishing slope. With boilers, he estimates that a tenfold increase in capacity yields a 40 per cent economy, so that one could get ten times as large a boiler for six times the cost. With generators, he estimates that a tenfold increase in size brings a 65 per cent economy allowing for equal speeds, so that the larger generator would cost only three and one-half times as much as the smaller. With transformers the saving runs from 65 per cent on 22,000-volt transformers to about 77 per cent on 110,000-volt instruments, so that one could get ten times as large a transformer of the 110,000 volt type for only two and three-tenths times the cost. And since a 10,000-kilowatt turbo-generator requires little more space than one of 1000 kilowatts, there is another large economy in housing the plant.

Further material savings are secured from superheaters and economizers, which save about 10 per cent of the fuel, and whose relative cost decreases as the size of the plant increases; also condensers, feed-water heaters, water-softening plants, mechanical stokers, and other machinery for handling coal and removing ashes, and other devices. He also mentions the screening of fuel, and the securing of a guaranteed and uniform fuel supply by purchasing under specifications—an advantage available only to large buyers. This last is an excellent example of intangible overhead. As for labor, Mr. Lincoln mentions that a 10,000-kilowatt generator requires little more attention than one of 100 kilowatts, the number of bearings being similar. This item of labor is clearly a "constant" cost, while all the labor-saving devices already mentioned have their natural effect on the wage-bill. Furthermore, the large plant can have not only larger units but more of them, and thus gain flexibility being able to run at different rates of output while the working units are always running near the rate which brings maximum economy. There are definite objections to trusting as much as one-fourth of the load to a single machine.[6]

As one might expect from this list of savings, the figures of cost show a decided economy with size, even in the case of quite large plants.[7] With gas, the case is somewhat different, as the economies of size appear to be exhausted before the very large plants are reached. H. G. Barker, in his *Public Utility Rates*, tabulates the operating expenses of seventeen plants of over 500,000,000 cubic feet, and seventy-six smaller plants of less than 300,000,000 cubic feet.[8] The smaller plants show cost increasing at a decreasing rate in a well marked curve. In fact, the curve $y = \sqrt[5]{x^4}$ fits the points quite remarkably well where y is cost in tens of thousands of dollars and x is output in tens of millions of cubic feet. For the larger plants, the downward curvature disappears and the trend is to all intents and purposes a straight line:

$$y = .42\,x + k,$$

k being so small as to be neglible in comparison with the large totals. In other words, operating expenses of large plants average 42 cents per thousand feet, with no perceptible savings from greater size. These figures behave so like those of railroads that the coincidence is striking. The reader will remember that the curve of operating expense showed a slight downward curvature for roads of small traffic density, agreeing fairly well with the curve $y = \sqrt[5]{x^4}$; but losing all visible curvature as the traffic densities became larger.

Telephone companies, on the other hand, show no signs of economy with increased size, but rather the opposite. Figures published by the Wisconsin Railroad Commission indicate that in terms of operating expense, the most economical size is from 350 to 1500 telephones, while the lowest capital cost falls between 300 and 1000 telephones, and the combined cost appears to average least for plants of from 300 to 1250 instruments.[9] The cost for Milwaukee was about double the average for this group, while for Madison it was more than one-third in excess. For the smaller plants there is also a much wider range of variation in cost than the larger plants show; perhaps because the personal equation has more scope.

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[6] See *Report of National Electric Lighting Association Committee on Prime Movers*, 1919.

[7] See *Report, Wisconsin Railroad Commission* 1916, pp. 640-41, 676-77, for unit costs of companies of Class A and Class B in that state.

[8] H. G. Barker, *Public Utility Rates* (New York: McGraw-Hill Book Company, Inc., 1917), pp. 297-99. Two of the smaller plants are in large cities and are grouped by Barker with the larger plants.

This increase of cost with size does not necessarily measure the cost of consolidating all the telephones in a given community under one organization, since rival companies would have to duplicate a great deal of the cost of the distributing system. However, the decisive element in favor of consolidation is not cost, but service. And in apparent defiance of the facts as to costs, those in the telephone business appear to consider that added business may increase earnings more than it increases expenses, even though it does not cover its pro rata share of overhead. With the data at hand it is impossible to say whether this represents an example of the short-run point of view, where a plant, for the moment, has spare capacity; or whether it is a fair long-run estimate of the cumulative benefits of increased business. As it stands, it represents an interesting and rather typical paradox in economic judgments. The introduction of automatic telephone exchanges is an interesting innovation, involving an enormous investment, a corresponding reduction of direct operating expense, and an investment in machines-to-make-machines which looks a generation ahead. This device—a mechanical marvel suggesting a magnified human brain and nervous system —shifts the emphasis from work of operation to work of maintenance, renewal, and extension, which now becomes the chief variable element in costs, and requires foresight and careful scheduling to avoid the vicious irregularities which play so large a part in the business cycle and lay so heavy a burden upon industry.

Public utilities are subject to both daily and seasonal rhythms, though gas plants dispose of the daily peak by storage, and thus do not need producing capacity equal to the highest momentary rate of use. However, the distributing system must provide capacity for the daily peak, not merely for the daily average. These rhythms are to some extent subject to control, but within fairly definite limits. The fundamental habits of people's lives will not be changed by rate systems, but they may learn to cook with gas, or to use electric vacuum cleaners in the home, while factories will use whatever power is cheapest, and will accept restrictions on its use if it is made worth their while to do so. The chief purposes of a rate system should be to earn a reasonable total return, to develop the utmost use of the facilities so long as every service pays at least its differential cost, and to distribute residual costs fairly according to the responsibility of different users for the amount of these costs.

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[9] *Report, Wisconsin Railroad Commission*, 1916, pp. 348-51, 370-73. Combined cost estimated by the present writer on the basis of operating expense plus 7 per cent on cost of plant and equipment.

The expenses of a public utility vary with many things. The investment in the central station depends upon the capacity required, and this depends upon the maximum demand the plant expects to have to meet, with the proviso that it pays to build large enough to take care of some years' growth, rather than be continually rebuilding. The investment in the distribution system depends jointly upon the distance which has to be covered and the maximum demand which each part of the system has to be prepared to meet. Here, too, it is economical to build ahead of growth, in moderation. Coal consumed, and some elements of wear and tear, depend upon output; while the costs of billing, meter reading, and investment in meters depend more nearly on the number of consumers than on any other factor, though certain classes would require more expensive meters.

However, the "capacity" expenses do not necessarily vary in exact proportion to capacity, and there is, as we have seen, an economy in plants of large capacity so that cost does not increase pro rata. These costs may depend on maximum demand, but a 5 per cent increase in maximum demand may typically necessitate only a 4 per cent increase in the "capacity costs."[10] Then any given unit of business is self-supporting so long as it pays four-fifths of its pro rata share of the capacity costs. And if the plant has spare capacity, then business need not pay any of the capacity costs in order to be self-sustaining. As for the output expenses—those which vary with output—daily fluctuations will produce one kind of variation in them, seasonal fluctuations another, and long-run growth still another. Output expenses are, of course, reduced to their lowest terms in hydro-electric plants, but are fairly substantial where plants burn coal.

[10] This 4 per cent need include only expenses made *necessary* to handle a possible increased demand, not labor-saving devices made *profitable* by an increase in output. The latter are really output costs, partly offsetting the decrease in operating expenses per unit of service, which results from increased size.

68. The Special Strength of the Public Utility Industries *

The value of an investment security is frequently reduced to certain alleged fundamental elements such as margin of safety, income, and market ability. But such an analysis is at best superficial. All elements of investment value may be reduced, ultimately, to the earning capacity—the economic reason to-be—of the enterprise that issues them. . . . It is obviously and without equivocation the basis of value for corporate stocks and bonds, because all the characteristics that make or mar a corporate security are, in the end, dependent on the simple question: Does the corporation which created the security possess the inherent earning capacity to insure the continued payment of interest or dividend? . . .

Without further preliminaries it is possible, therefore, to reduce the question of the investment value of public utility securities to the fundamental, but somewhat complicated, question of the factors controlling the earning power of the public utility enterprises themselves. Determine the elements of strength and of weakness in the industries furnishing electricity, water, and gas to local communities; and you determine, at the same time, the elements of strength and weakness of their corporate stocks and bonds.

Much uncritical propaganda has been indulged in by banking houses, the interest of which was to show the unmitigated virtues of public utility securities. This is unfortunate, because exaggeration and unjustifiable pronouncements tend to destroy the confidence of investors and to create an attitude of suspicion among those investors who are themselves unable to analyze securities. This high-pressure salesmen's talk and bankers' propaganda is particularly unfortunate in the case of electric, water and gas securities because no class of investments can be more easily appraised by the investor, and few types of investment are so well able to stand on their own feet. That they, like all securities, have conspicuous weaknesses is as much a part of the picture as their undoubted elements of strength. Let us consider certain of these weaknesses first.

Low Earning Power on Invested Capital a Conspicuous Feature. The industry as a whole has a low earning power with reference to the capital invested: and this low earning power is sanctioned by law, as interpreted by the United States Supreme Court. Even a superficial study of our great industries, reënforced by the slightest array of statistical ratios, shows that the net return per dollar of invested capital is probably the lowest for water works of any of the industries soliciting capital from the public; and the net return on gas works is only slightly more. The net return to electrical enterprises, although, on the whole, greater than that for water and gas, is conspicuously less than that on banking, transportation, merchandising, and manufacturing, when this return is expressed in terms of net profits per dollar of invested capital.

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* Excerpts from Arthur S. Dewing, "Special Strength of Public Utility Securities," *The Annalist*, XXXI (January 13, 1928), 66-69.

Combined with this inherently low ratio of earnings on the invested capital, various decisions of the courts and the commissions have given scant consideration to skill of management. These decisions have run something as follows: The public utilities shall be entitled to a fair return—from 6 per cent to 8 per cent—on the amount of capital wisely and prudently invested (provided they can earn this amount), but they shall not be entitled to any return for unusual managerial ability. On the other hand, if, through accident or plain stupidity, a management fails to show even the usual business acumen, then the losses shall fall directly on the industry itself and indirectly on its security holders. The bondholders and stockholders have nothing to gain from extraordinarily good management, but they have much to lose from poor management. . . . In consequence the spur to large profits and to unusual achievement is not found among public utilities to the extent that it is found in other types of industries. . . .

The Industry in Its Economic Youth. All industries have their periods of youthful strength, when profits are enormous but money is hard to obtain; they have their periods of maturity, when profits are at balance of equilibrium and money is comparatively easy to obtain: they have their periods of old age, when profits diminish or disappear and money is easy to obtain because the industries have become hallowed by traditions and conservatisms. These long-established and decadent but eminently respectable industries afford the lawyer and trust company trustees their conservative investments.

The electrical industry is still in the age of its youth. And the investor has the advantage of relatively high rates of return consequent upon the incessant demand for new capital by an advancing, expanding industry; and he has at the same time the strength of an industry operating under the law of increasing returns. In other words, the investor has the advantage of the higher level of return due to a continued and increasing demand for capital, coupled with the strength of a class of security based on the earnings of property, the rate of which increases, rather than diminishes, with additional capital investment. This is a type of investment embodying an unusual combination of large return and assured safety. While the principle applies with conspicuous force to investments in electric utilities, it applies to a large degree also to investments in water and gas companies.

Second only to the value of public utility securities, based on the increasing earning power of the utilities themselves, is the stability of this earning power. It has become commonplace to refer to the immunity of these securities from the shocks of panics and booms. But there is something deeper than this. Nor can this stability be accounted for by the obvious and simple fact that water, gas, and electricity are necessities of our twentieth century urban life. Water is no more necessary, especially the delivery of it at the faucet, than food; gas and electricity are less necessary than clothing and shelter. Yet no food products, not even wheat, are produced or distributed under such stable conditions of economic production, and result in such stable profits as is the case with the production and distribution of water, gas, and electricity. There is more to this stability of earnings than the simple fact that the utilities supply necessities.

It is this: The buyer of a loaf of bread must make a conscious choice leading up to its purchase. During a panic he will feel poor, and necessary though bread may be, a certain amount of resistance must be overcome before he consents to the purchase of the individual loaf. Necessary though meat is to his daily diet, he will buy less if he feels poor. But no such buying resistance must be overcome in buying water. No man draws less water to wash his hands because he feels poor, nor drinks less. Clothing is necessary, but a man may still wear the last year's suit and his lady the last year's coat when a business panic has cast its shadow over the household; a man cannot burn his last year's gas nor light his kitchen with last year's electricity.

The real explanation of the stability of the public utility earning power is that water, gas, and electricity are bought in small quantities, each individual purchase being of immediate and vital use to the consumer. The economist tells us of the great margin between the cost to the consumer of certain commodities and the real value they possess at the time of purchase in the eyes of the consumer. He calls this margin the consumer's surplus—a kind of excess of value the consumer gets but does not pay for. Water, gas, and electricity have each an enormous consumer's surplus. Consequently they will be bought in about the same quantities when a man feels poor as when he feels rich; and the gross earnings of the corporations supplying these commodities are little affected by the cyclic pulsations of industry; and the net earnings available for interest and dividends on their securities are maintained in the even tenor of their way.

Court Decisions Provide Important Element of Strength. A third element of strength in utility securities lies in certain findings of the Supreme Court. These utilities are sometimes called "legal monopolies." But whatever the expression means, if it means anything, it carries little significance in weighing the strength of public utility securities as a class. In states such as South Carolina and Rhode Island—to include different sections of the country—where there are no utility commissions and little regulation, the industries thrive no less well than in other states. In fact, neither the rates nor the earnings of utilities in states without regulation differ greatly from the rates or the earnings of utilities subject to extreme regulation. Even the fact that some states, like Ohio, regulate and restrict without protecting the utilities affects their earnings but little.

The real basis of strength of utility securities, so far as the law is concerned, is that in a series of decisions leading up to and following Willcox *vs.* Consolidated Gas Company [1] the Supreme Court has said that the utility—irrespective of regulation and franchise rights, and limitations—is entitled to a fair return on the capital devoted to the public use. What is a fair return is still open to interpretation; and the measure of invested capital, never clearly defined by the court, is even now befogged by the Indianapolis water case. But in principle the court is clear. If the investor requires not more than 6 per cent, on the lowest estimate of actual capital in the enterprise, to pay his interest or his dividend, he can feel sure that the highest tribunal of the land will throw its protecting mantle over his investment. The court may not guarantee that he receive his interest or his dividend, but it does guarantee that no legislation or commission rulings shall emasculate the inherent earning capacity of the property behind his investment.

[1] 212 U.S. 19.

CHAPTER V

THE LEGAL STATUS OF THE PUBLIC SERVICE INDUSTRIES

69. The Public Utility Concept in American Law *

Kind of Business Affected. Since not long after the Civil War we have accustomed ourselves to "private business" as one large category, and "public business" as another. The distinction is part of our settled ideas, and it has become a pretty clear thing in the treatment of the respective classes after the labeling has been accomplished. Although recent history is a progression of state interference in both sorts, in the "public" business it has fallen into definite lines, common to most of them, and is put under special agencies of control which run to type in their characteristics, their make-up and their function. A whole field of law thus covers the businesses once publicness is conceded; but the questions, why is this enterprise "private" and that "public," and what are the bases of the selection for the special treatment, are far from being readily answered. Should the inquiring Martian tax us to explain, we should, no doubt, in some language or other, succeed in conveying that the answer lies in the sense, upon the part of contemporary society, of its dependence upon certain sorts of enterprises. We should package the idea in phrases such as "felt needs," "economic dependence," or the like.

A logical Martian might then list the things on which, as human beings, we are most dependent, and conclude that the public utilities class are the enterprises by which food, water, shelter, fuel, or clothing are purveyed; surveying the current organization of local society, so largely urban and so greatly not self-supporting in the sense that the rural population used to be, he might then add the processes of distribution. But we should say him nay as to the necessaries of life as a category, and we should tell him that of the distributive processes, not all, but only one, has fallen into the class of publicness; that merchandising, even of the necessaries, is not "public" business, nor is banking nor the large financial fabric of distribution,[1] but that transportation is "public" and that it is "public" aside from the character of the article handled. In the face of these statements, he might then shift his ground and say, "Is it then a matter of bigness; if enterprises grow so large that the operation of the laws of the competitive system are interfered with, they become public and are regulated by the positive law?" But again we say no. We mention the Sherman Act, the Clayton Act, Federal Trade Commission Act, Packers Act, but not Public Utility acts. Mere size has not made an enterprise public. Recently the largest ten of the country's corporations were listed.[2] The hugest of all—which in a similar list of world corporations, including governments, was outranked only by the United States of America and the British Empire—was not a public utility, nor was it the most profitable.

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* Excerpts Gustavus H. Robinson, *Harvard Law Review*, XLI (Jan., 1928), 277-308.

Neither of these direct and frontal attacks upon the inquiry give an answer. So far as there is one it has been arrived at by flanking movements, and the slow approach. One case established has served as a cover for further advance, and the definition of a public utility is a communique of positions won, or, if one takes the individual viewpoint, of those lost. "We can best explain by example," says Mr. Justice McKenna.[3] He gives the clue to the early judicial technique employed when he adds, "The transportation of property—business of common carriers—is obviously of public concern and its regulation is an accepted governmental power." The obviousness was a matter of history merely and was not obvious if the history went far enough back,[4] but the momentous thing was that, as to common carriers, regulation *was* accepted. This furnished a point of departure; and the answering of the question "what businesses are public?" became, and, both in the courts and legislatures, till lately remained, a process of adding to or excluding from the list of "common carriers."

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[1] Banking is, of course, pretty closely regulated and the public interest in it is expressed in a number of ways. See *Schaake* v. *Dolley*, 85 Kan. 598, 118 Pac. 80 (1911), holding that the principles underlying the doctrine requiring certificates of public necessity and convenience for new public utilities are applicable when new banks are in question, relying upon the state guaranty fund scheme upheld in *Noble State Bank* v. *Haskell*, 219 U.S. 104, 575 (1911).

[2] *Reilway Age*, XXCII (1927), 1049. The figures are: U. S. Steel, $2,446,000,000; Southern Pacific Railroad, $2,147,000,000; Pennsylvania Railroad, $1,819,000,000; American Telephone and Telegraph Company, $1,646,000,000; New York Central Railroad, $1,449,000,000; Standard Oil, New Jersey, $1,369,000,000; Union Pacific Railroad, $1,140,000,000; Atchison, Topeka and Santa Fe Railroad, $1,071,000,000. General Motors and the Ford Motor Company finished the list but the automobile companies were both relatively and absolutely the most profitable.

[3] *German Alliance Insurance Co.* v. *Lewis*, 233 U.S. 389, 406 (1914).

[4] See Adler, "Business Jurisprudence," *Harvard Law Review*, XXVIII (1914), 135, 156. It is there shown that the distinction was not in the

With transportation as an accepted jump-off the list grew by analogy. It was said that,

> . . . they all have direct relations to the business or facilities of transportation or distribution—to transportation by carriers of passenger, goods, or intelligence by vehicle or wire;—to distribution of water,[5] gas or electricity through ditch, pipe or wire; to wharfage, storage or accommodation of property before the journey begins, when it ends, or along the way. When thus enumerated they appear to be grouped around the common carrier as the typical public business.[6]

The older technique thus discloses an assumed starting point, arrived at by an historical inquiry, which finds the carrier to be "public." That it was such, represents both a grouping of circumstances on the one hand and the response to them, in terms of law, by a prior social order, on the other; but the cases which developed public utility doctrines out of the carrier have been content to build upon the response alone rather than upon the factual background and the response to it taken together.[7] In the earlier "carrier" law the social interest spoke largely with respect to the bailment feature, and our treatment till a comparatively recent period has been of "bailments and carriers." The bailment responsibility which bulked so large under former conditions is far less a factor nowadays, as the newer policies of restricted liability indicate;[8] and the more recent

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kinds of the service but in the manner of doing service of whatever kind. A more recent article to the same effect is Arterburn, "The Origin and First Test of Public Callings," *University of Pennsylvania Law Review*, LXXV (1927), 411, 418.

[5] It will be noticed that water comes in as water transported, rather than as water, a necessity of life.

[6] Mr. Justice Lamar, dissenting, in *German Alliance Insurance Co.* v. *Lewis*, 233 U.S. 389, 426-27 (1914). See Beale, "The Carrier's Liability: Its History," *Harvard Law Review*, XI (1897), 158; Arterburn, "The Early Liability of a Bailee," *Michigan Law Review*, XXV (1927), 479.

[7] "We overlooked completely that the law maker is the man of his time thoroughly saturated with the thoughts of his time, thoroughly filled with the culture that surrounds him, that he works with the views and conceptions that are drawn from his sphere of culture, that he speaks with words that have a century of history behind them and whose meanings were fixed by the sociological process of a thousand years. . . ." I. Kohler, *Lehrbuch des Burgerlichen Rechts*, §§ 38-39; in Pound, *Readings in Roman Law* (2d ed., 1914), p. 20.

[8] For recent discussions see *Virginia Law Review*, XII (1926), 235; *Cornell Law Quarterly*, XII (1927), 203.

social interest has lain in the defining and the enforcement of duties which are conceived as existent prior to the assumption of service for a customer, and as running in favor of those who might seek to become customers. From liability in service the law turned to the development of the duties to the general public as conceived to be inherent in the idea of being a utility enterprise.

The famous Munn case[9] is a classic example of the judicial method adverted to. Carriers of various sorts are ''regulatable in England from time immemorial'': Munn's elevator ''stands in the gateway of commerce,'' part of the stream of transportation: it is clothed with a public interest ''by the facts that Munn's plant was not only a pool in the stream of commerce, but the neck of the bottle at Chicago, part of a ''virtual monopoly.'' Was it ''public'' because of *all* the circumstances, or would any one set, separately, suffice to justify the label? All contributed to the decision in the case itself, but the process of originally combining circumstances A, B, and C into result X has not precluded a later arrival at result X by adding only A to C, or even from A or B or C alone. The X of the Munn case is stated as simply, ''grain elevators are 'public'.'' Soon the Court said, ''When it is once admitted, as it is admitted here, that it is competent for the legislative power to control the business of elevating and storing grain,''[10] the special circumstances became irrelevant. Grain elevators were public, when the legislature said so, because they were grain elevators rather than because they were grain elevators under special circumstances.

Stockyards are public because ''intimately related to the business of transportation'' and because ''a practical monopoly of a vast business,'' and because the business ''corresponds with that of warehousemen, and therefore is subject to the same principles of law.''[11] Later, stockyards are public utilities in their own right.[12] A cold storage business is ''public'' because it is a part of the distribution system linked with transportation.[13]

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[9] *Munn* v. *Illinois*, 94 U.S. 113 (1876). It upheld a statute setting rates for grain elevators as applied to an elevator business which had begun long before the regulation.

[10] *Brass* v. *Stoeser*, 153 U.S. 391, 403 (1894).

[11] *Ratcliff* v. *Wichita Union Stockyards Co.*, 74 Kan. 1, 86 Pac. 150 (1906).

[12] See Packers and Stockyards Act, 52 Stat. 159 (1921); U. S. *Comp. Stat.* (Supp. 1923), 8716¼; *Stafford* v. *Wallace*, 258 U.S. 495 (1922). The statute is stated and discussed in *Columbia Law Review*, XXII (1922), 68.

[13] *Public Utility Commission* v. *Monarch Refrigerating Co.*, 267 Ill. 528, 108 N.E. 716 (1925); *Illinois Law Review*, XI (1916), 281

Enough has been shown to illustrate the technique of the advance by the method of real or fictional analogy.[14]

The German Alliance Insurance case [15] was an advance under newer cover, since it could not start from the carrier. Some of the court could not follow in the new departure, which put insurance, an old and approved game of chance, long justified of its utility in distributing losses, into the class of businesses so far "public" that its rates are regulatable.[16] Necessarily departing from the simple analogy method, the case adopts a phraseology and a question. Quoting the language of one of the New York elevator cases,[17] Mr. Justice McKenna says, "The underlying principle is that business of certain kinds holds such a peculiar relation to the public interests that there is superinduced upon it the right of public regulation"; and he asks, "Is the business of insurance within the principle?" [18]

The problem is thus made to hinge less upon the historical analogies and more upon current idealism, and the machinery which gives expression to the "ideals of the epoch" enters upon the task of selecting the enterprises for special treatment. The machinery of selection has gone through several phases. The courts themselves made no great difficulty in creating or denying new categories of "public" businesses so long as the process was that of analogizing on the carrier, or on some other calling traditionally common. Cotton gins were declared by one court to be "public" [19] and by another not to be.[20] The question was not beyond the judiciary in either case. The present day machinery, however, is set forth with the statement that, "until the legislature brings a business within the police power by clear intent, the courts will not do so." [21] It is thus become a complex machinery: the legislature speaks and the court also speaks, and because the selection is conceived as a matter of ''due process of law'' within the content which the Supreme Court of the United States may put into that phrase the apparatus is a combination of legislature-court-state-and-federal elements.

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[14] The method of analogizing the carriage is dealt with in a Note in *Harvard Law Review*, XV (1902), 309.

[15] *German Alliance Insurance Co.* v. *Lewis*, 233 U.S. 389 (1914); *Harvard Law Review*, XXVIII (1914), 84.

[16] A recent book shows how deeply society has entered upon its supervision. Patterson, *The Insurance Commissioner of the United States* (1927) reviewed in *Harvard Law Review*, XLI (1927), 111. The present court's attitude toward the case is stated by Mr. Justice Sutherland, in *Tyson* v. *Banton*, 273 U.S. 418, 434 (1927). It "marks the extreme limit," he says.

[17] *People* v. *Budd*, 117 N.Y. 1, 27, 22 N.E. 670, 677 (1889), aff'd *Budd* v. *New York*, 143 U.S. 517 (1892). It applied the Munn case to elevators at Buffalo.

[18] 233 U.S. at 411.

[19] *Tallahassee Oil and Fertilizer Co.* v. *Holloway*, 200 Ala. 492, 76 So. 434 (1917).

[20] *Ladd* v. *Southern Cotton Press and Mfg. Co.*, 53 Tex. 172 (1880).

[21] *State* v. *Spokane*, etc., R. R., 89 Wash. 599, 605, 154 Pac. 1110, 1113 (1916).

On the actualities one might neatly and safely define a ''public utility'' as any form of enterprise so labeled if and when the state and federal authority agrees with the label. This, of course, gives only a list of positions already taken: a category of things established rather than a formula wherewith to establish new things. Many of the ''principles of the law'' in other fields are thus made up.

This ''definition'' leads to an interesting inquiry: are all those who *do* deal with the general public potentially subject to having the stamp ''public utility'' impressed upon their business? Can any formula state the case more than to say that conditions as expressed by legislators and checked—''checked'' both in the sense of verified and in the sense of stayed—by the judiciary, will be the process, but that on the whole the history of the last fifty years makes safe the forecast that a half century hence the public utility status will have been imposed upon more businesses? For one thing we have now a psychological acceptance of the idea of the state's ''invasion'' of business; the competency of a competitive system, based on untrammeled individualism, to do all things necessary for social good, is no economic maxim of this day, nor is individualism one of its juristic fetishes.[22]

In the last few years several legislatures have sent forth, to run the gauntlet of the judicial clubbing, various ventures in the labeling of new public utilities. So frequently are there several states upon a territory not too large to be adequately administered by one, that the grumblers at the expense forget the usefulness of the states as experimental plots for new juristic crops. Kansas and New York recently offered themselves for such crops. The gardening in the Sunflower State which withered under the scorching ray of the Supreme Court, was an attempt to declare publicness upon the general theory of our Martian. It followed the demand of the Governor of Kansas for legislation,

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[22] See Sombart, "An Economic Forecast," *Living Age*, CCCXXXII (1927), 1070. Sombart considers that "Public control of industry is inevitable because classes of society which exercise great and growing influence demand it."

"Declaring the operation of the great industries affecting food, clothing, fuel, and transportation should be impressed with the public interest and subject to regulation by the state." The phrase "necessaries of life" is so frequently used in the governor's message and in the resulting statute[23] that both apparently originated in the impulse to read "public utilities" as substantially a correlative for it.

The fate of these frank innovations is a commentary on how far the Supreme Court will take a state's own declaration of readiness and ecological fitness as an experimental plot for new crops. . . .

We are thus brought to a discussion of the Wolff Packing cases which also were twice[24] before the Supreme Court. They concern the Kansas declaration of publicness as applied to the food industry. Comment has dealt with them as decisions in the labor field, as the order of the Industrial Court which the Wolff Company resisted in the first case prescribed a scale of wage increases and, in the second, an hours of labor schedule. Since neither wage nor hours[25] litigation necessarily involves the question of what may be called public utilities, the court's discussion of the latter topic was not the only path to the reversal of the Kansas Supreme Court's judgment that the Company must obey the orders; but since the statute was presented to the courts as an expansion of the public utility classes and the state judiciary had decided on that theory the Supreme Court was naturally led to that particular aspect of the Act. Mr. Chief Justice Taft accepted the assignment. Speaking for the Court he made the most recent authoritative effort to answer the question of this paper:

> Businesses said to be clothed with a public interest justifying some public regulation may be divided into three classes:
>
> (1) Those which are carried on under the authority of a public grant of privileges which either expressly or impliedly imposes the affirmative duty of rendering a public service demanded by any member of the public. Such are the railroads, other common carriers and public utilities.

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[23] This statute is analyzed in Humble, "The Court of Industrial Relations in Kansas," *Michigan Law Review*, XIX (1921), 675; Young, "Industrial Courts," *Minnesota Law Review*, V (1921), 185; Rabinowitz, "The Kansas Industrial Court Act," *California Law Review*, XII (1923), 1.

[24] *Chas. Wolff Packing Co.* v. *Industrial Court*, 262 U.S. 522 (1923); and 267 U.S. 552 (1925).

[25] Cf. *Adkins* v. *Children's Hospital*, 261 U.S. 525 (1923) (wages); *Muller* v. *Oregon*, 208 U.S. 412 (1908) (hours); *Bunting* v. *Oregon*, 243 U.S. 426 (1917) (hours).

> (2) Certain occupations, regarded as exceptional, the public interest attaching to which, recognized from earliest times, has survived the period of arbitrary laws by Parliament or Colonial legislatures for regulating all trades and callings. Such are those of the keepers of inns, cabs and grist mills. . . .
>
> (3) Businesses which though not public at their inception may be fairly said to have risen to be such and have become subject in consequence to some government regulation. They have come to hold such a peculiar relation to the public that this is superimposed upon them. In the language of the cases, the owner by devoting his business to the public use, in effect grants the public an interest in that use and subjects himself to public regulation to the extent of these interests although the property continues to belong to its private owner and to be entitled to protection accordingly.[26]

It will be observed that in this listing the first paragraph would appear to make "the public grant of privileges" the touchstone. What is meant by the phrase is not defined, but though "common carriers" are included they have frequently been such though no "public grant of privileges" appeared, and even in the case of other indisputable "public utility" types the special privilege has not been an essential.[27]

The second paragraph is the historical approach in a new and restricted fashion, selecting only "cabs" out of the carrier classes. In the Munn case, Mr. Chief Justice Waite read the list of survivals more widely, as "ferries, common carriers, hackmen, bakers, millers, wharfingers, innkeepers, etc." [28]

The classes of the third paragraph indicate a realignment of reasons for the Munn, the Brass, and the Budd cases; the actual opinions in these combine the historical and analogy methods with the language which the present Chief Justice uses, and which is paraphrased from the Munn decision. Only in the banking, the insurance, and in the rent cases did the opinions cut loose from the earlier methods. One may surmise that the Chief Justice was relieved indeed to conclude that he did not need to decide "definitely whether preparation of food should be put in the third class"—which he in his sentence calls "the third class of quasi-public businesses" [29] but his excursion into the unnecessary, while it has not clarified the vague wording of the Munn case,[30] has at least made manifest that if the state of Kansas had persisted in its program any closely subsequent decision of the Supreme Court would be adverse to the experiment. It seems clear also that the consideration given to the fact of the free flow of food into Kansas under competitive conditions of national scope would indicate a like ruling as to coal and as to clothing.[31] It appears fair to say, therefore, that under conditions likely to continue for an unpredictable period any state endeavoring to make ''public utilities'' and ''necessaries of life'' approximately interchangeable will not secure the assent of the Supreme Court. . . .

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[26] 262 U.S. at 535.

[27] *Wingrove* v. *Public Service Commission*, 74 W. Va. 190, 81 S.E. 734 (1914).

[28] 94 U.S. at 125.

[29] Yet the Federal Government itself has become deeply committed in the regulation of the packing industry. See note 12, supra.

A recent case, *Cudahy Packing Co.* v. *United States*, 15 F. (2d) 133 (C.C.A. 7th, 1926) holds that a demand by the Secretary of Agriculture that the packers open their books to his auditor without limitation as to the character of the business examined was too wide.

''Devotion'' to the Public. Having thus pursued the topic of the public business down to the latest decision, only to discover in it a new experience in the tyranny of ancient phrases, we turn to the history of another phrase. Beside calling to new life the words of Lord Holt, Mr. Chief Justice Wait in the Munn case combined them with some of his own. ''Property,'' he said, ''does become clothed with a public interest when used in a manner to make it of public consequence.'' [32] This Mr. Justice Sutherland in the Tyson case quotes. He then continues:

> The significant requirement is that the property shall be devoted to a use in which the public has an interest, which simply means . . . that it shall be devoted to a "public use." Stated in another form, a business or property, in order to be affected with a public interest, must be such or be so employed as to justify the conclusion that it has been *devoted* to a public use and its use thereby, in effect, *granted* to the public.[33]

The question thus arises whether the conduct or method or course adopted by the individual enterprises figures in bringing the state into his affairs. He may desire to engage in an activity not yet ''public,'' or he may desire to enter into one which wears an already established ''public'' labeling. As to the former he is secure so long as the enterprise itself remains in the private category; but the inquiry now raised is whether he is necessarily subject to regulation merely because he is in a type of enterprise which already is or which becomes ''public.'' Munn did no devoting or granting in any volitional sense. He vigorously fought the grant which the Supreme Court assured him he had made, and the whole litigation is the record of his unwillingness. So far as he was concerned, the public forged his signature to its invitation to a share of control in his business.

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[30] See Rottschaeffer, "The Field of Governmental Price Control," *Yale Law Journal*, XXXV (1926), 438, 445.

[31] Young, supra, note 23, written prior to the Wolff cases, shows that, up to then, the Industrial Court had very realistically handled a milling case.

[32] 94 U.S. at 126.

[33] 273 U.S. at 433-34.

Yet the phrase has developed a clear content since Munn's time, and is the epitome of another set of explanations upon the question what is or may be made to be a public utility. Historically, the carrier again furnishes the starting point. Transportation as an occupation distinguished from, say, baking, was "public," but not all transportation fell under regulation. The classes were "common carriage" and "private carriage." Recent scholarship [34] has shown the ancient meaning of "common carriage" to be simply carriage as a business, and many cases and some writers state the principle under which regulation becomes proper to be whether the carriage is or is not made a "business." [35] Accent on this word furnishes the background for recent legislation. . . .

Thus the settlement of the public or non-public character of the enterprise as a class does not of itself determine the validity of the application to it of the regulatory authority. Even with food, or fuel, or housing, or amusement purveying, established as "public" enterprises, this question of "dedication" remains.

A difficulty arises, however, when The Pipe Line Cases [36] are considered. There the outstanding fact was that the Standard Oil Company, by having control of the pipe lines, refused to carry any oil unless the same was sold to it, thus carrying no oil for anybody except itself. The decision that the pipe lines were common carriers was arrived at largely by main strength. Mr. Justice Holmes said:

> The provisions of the act are to apply to any person engaged in the transportation of oil by means of pipe lines. . . . If the Standard Oil Company and its coöperating companies were not so engaged no one was. It not only would be a sacrifice of fact to form but would empty the act if the carriage to the seaboard of nearly all the oil east of California, were held not to be transportation within its meaning, be-

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[34] See the Articles cited supra note 4, and Burdick, "The Origin of the Peculiar Duties of Public Service Companies," *Colorado Law Review*, II (1911), 514.

[35] *Cushing* v. *White*, 101 Wash. 172, 172 Pac. 229 (1918), collects and cites the language of many texts and cases.

[36] 234 U.S. 548, 559 (1914). The case is laid against a background of the monopolistic character of the Standard Oil Company and the part in its monopoly played by its control of the pipe lines. "The circumstances in which the amendment (to the Interstate Commerce Act) was passed are known to every one." 234 U.S. at 558.

cause by the exercise of their power the carriers imposed as a condition to the carriage a sale to themselves. . . . (The) evident purpose was to bring within its scope pipe lines that although not technically common carriers yet were carrying all oil offered, if only the offerers would sell at their price.[37]

However, desirable as part of an effort to club monopoly, the case is a stumbling block to the statement of the doctrines of the Supreme Court as set out in the Duke and Producers Transport cases, unless, indeed, that tribunal is prepared to limit the later language to the precise terms it uses, that no *state* "by mere legislative fiat (may) . . . convert into a common carrier." The effort to rationalize the earlier decision so as to make the pipe lines which are conceived of as "common carriers in substance" "to become so in form" would negative this, and The Pipe Line Cases are left to be explained as another illustration of the use of fiction in law as a device for achieving ends which current opinion will accept.

The question being thus one of fact, some of the results naturally lie open to discussion as findings of that character. Some recent decisions are of interest. When Judge Elkus remarked in 1920 that the term "common carrier" had been successively applied to each new development and that "to-morrow, in a proper case, it may well be that it may be applied to that most recent device for eliminating the fetters of distance, the aeroplane,"[38] the matter he had in mind was just around the corner. It was presented in the form of an action upon an insurance policy allowing added compensation for accidents sustained on various named vehicles "or other public conveyance provided by a common carrier." Recovery called for bringing within this term a plane in which the operator took up persons, at a charge of five dollars each, and circled about for ten or fifteen minutes. In North American Insurance Co. *v.* Pitts,[39] the court went elaborately into the meaning of "common carrier" and came forth with a denial of recovery, but largely on the ground that this type of conveyance was not within the terms of the policy. In adverting to the aeroplane as used in the manner indicated, the court said that it was operated "as a private carrier . . . under special contract." Such cases may be likened to those concerning pleasure apparatus such as ferris wheels or roller coasters where the movement is not for transportation purposes, but they, of course, can have no bearing on air transportation systems which already are a factor in English and Continental transportation. . . .

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[37] The case naturally enough bothered the California court in its pipe-line decision. In *Associated Pipe Line Co.* v. *Railroad Commission*, 176 Cal. at 525, 169 Pac. 62 (1917), it said: "Respondent lays great stress upon a decision of the United States Supreme Court entitled *United States* v. *Ohio Oil Co.* (The Pipe Line Cases), 234 U.S. 548. . . . To our minds, there are many features of this case which clearly distinguish it from that at bar." It then recited the monopoly features based upon the Standard's buying up policies, and distinguished the cases on that basis.

[38] *Anderson* v. *The Fidelity & Casualty Co.*, 228 N.Y. at 480, 127 N.E. at 585. It was an action on an insurance policy which had special provisions concerning accidents while riding on a "common carrier." It held a taxicab to be one.

[39] 213 Ala. 102, 104 So. 21 (1925). In *Brown* v. *Pacific Mutual Life Insurance Co.*, 8 F. (2d) 996 (C.C.A. 5th, 1925) the facts and decision were similar. The cases are respectively noted in *Illinois Law Review*, XX

California has recently sought again, and by a new approach, to bring under regulation an enterprise which by the tests thus far worked out, had not been "devoted." In Frost *v.* Railroad Commission,[40] it evoked a decision which has fortified against regulation those who do business as did Guran and Duke. The Frosts had "a single private contract . . . for stipulated compensation." They used the California highways, and the local railroad commission cited them before it for operating without a certificate of convenience and necessity. It relied upon a statute which defined a "transportation company" as a "common carrier for the compensation over any public highway," amended in 1919 to apply specifically to automotive carriers of persons or property operating under private contracts. The commission conceded that the Frosts were private carriers. The state courts supported the commission and the Frosts brought the case before the Supreme Court, arguing that the act as applied to them denied due process. The Court agreed with them. Thus was upset the state's ingenious device to make the use of the state highways equivalent to a "dedication" to the public.

California's argument was based on the proposition that the state could grant or withhold the use, for business purposes, of its highways,[41] and might, therefore, grant their use on con-

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(1925), 511, and *Michigan Law Review*, XXIV (1926), 619. The former sees some complications because a legal duty to carry, it has been said, cannot arise out of such carriage because the flying is trespassing. How a bus which is a common carrier on a public road is any less one while trespassing through a private estate is not so clear: certainly it is not clear as to its liability to the people already in it. See Zollman, "Aerial Insurance," *Marquette Law Review*, XI (1927), 93.

[40] 271 U.S. 583 (1926). The details are given in *Frost* v. *Railroad Commission*, 240 Pac. 26 (Cal. App. 1925). The case in the Supreme Court is noted in *Boston University Law Review*, VI (1926), 259; *Illinois Law Review*, XXI (1926), 380; *Harvard Law Review*, XL (1926), 131.

[41] See Lilienthal and Rosenbaum, "Motor Carrier Regulation by Certificate of Necessity and Convenience," *Yale Law Journal*, XXXVI (1926),

ditions, and that the condition of "dedication" was valid. Mr. Justice Sutherland who wrote for the Court made this his point of departure:

> . . . the case presented is not that of a private carrier who, in order to have the privilege of using the highways, is required merely to . . . become subject to regulations appropriate to that kind of a carrier; but it is that of a private carrier who, in order to enjoy the use of the highways, must submit to the condition of becoming a common carrier and of being regulated as such by the railroad commission. . . . The power to prohibit the use of the public highways in proper cases—the state possesses; . . . the power to compel a private carrier to assume against his will the duties and burdens of a common carrier—the state does not possess. It is clear that any attempt to exert the latter, separately and substantively, must fall before the paramount authority of the Constitution. May it stand in the conditional form in which it is here made? If so, constitutional guaranties, so carefully safeguarded against direct assault are open to destruction by the indirect but no less effective process of requiring a surrender, which, though in form voluntary, in fact lacks none of the elements of compulsion.[42]

Mr. Justice Holmes wrote a dissent in which Mr. Justice Brandeis concurred.[43] Mr. Justice McReynolds, dissenting separately, said,

> Having built and paid for the roads, California certainly has the general power of control. Plaintiffs in error are without constitutional right to appropriate highways to their own private business as carriers

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163. See *Harrison* v. *Big Four Bus Lines*, 217 Ky. 119, 122, 288 S.W. 1049 (1926), where an established bus route was invaded by a taxicab service regardless of a local statute which forbade operation over a route for which another line held a certificate. The court sustained the statute under the theory that "The state . . . has the right to prohibit the use of the highways as places of private business, such as the appellants seek to carry on, or to grant the right to one and refuse it to another." See also *Kentucky Law Journal*, XV (1927), 351. *Public Service Commission* v. *West Maryland Dairy Co.*, 150 Md. 641, 135 Atl. 136 (1926), citing only a few local cases, held that a milk company which sent its own trucks out to the farmers comprising a Dairy Association which sold only to the milk company, was subject to the local public utility commission as to a permit to operate.

[42] 271 U.S. at 592, 593.

[43] 271 U.S. at 600-02. Mr. Justice Holmes, referred to *Packard* v. *Banton*, 264 U.S. 140 (1924), which held that a New York statute making necessary the bonding of those who operate motor vehicles for hire was not unconstitutional. Sutherland, J., wrote the opinion. *Checker Taxi Co.* v. *Collins*, 320 Ill. 605, 151 N.E. 675 (1926), sustained like legislation in Illinois, and Georgia has lately sustained a similar provision imposed by an ordinance of a city. *Transylvania Insurance Co.* v. *Atlanta*, 35 Ga. App. 681; 134 S.E. 632 (1926); *Illinois Law Review*, XXI (1927), 745.

for hire. And if, in so many words, the Legislature has said that no intrastate carriers for hire except public ones shall be permitted to operate over the state roads it would have violated no federal law.[44]

The elaborate fictions, under the doctrines of voluntary "election" by the victim, by which many new legal burdens have been laid upon unwilling backs[45] are thus controlled. Hereafter a constitutional power may not be so used as to obtain an unconstitutional result.[46]

Aside from any question as to state regulation of purely private carriers, as such, we have arrived through these recent cases at a pretty definite content for the phrase "devoted to the public." It means doing business or offering to do business with the public: only those who do so offer may have imposed on them the utility status. This has long since been pointed out as ancient.[47]

Labor "Devoted" to Public Utility Service. There remains the inquiry as to *what* is devoted or dedicated or granted to the public interest so that it "must submit to be controlled by the public for the common good." In any production of results in business the ingredients are things and men who work upon the things. The classical expositions of the economic order as regulated by the competitive system frankly put *both* men and things into the hopper. Regulation by competitive process was conceived of as operating upon the capital and upon the labor alike. Public utility regulation, however, has been a scheme for the control of *property* devoted to a public use. The familiar cases concern grain elevators, pipe lines, stockyards, housing, not taken as going concerns combined with the labor of men, but as the *property* of an owner. He was put under regulation personally only because of his relationship to *things*. But in 1917 the country realized that it was not interested in any sort of *property* devoted to the public use. Its interest was in the result produced by going concerns made up of things and of men, which were "devoted" to enterprises the country was especially interested in. There followed an articulate statement that since the same factors for securing results are at work under the new public utility regulation as under the old competitive scheme, the new should, somehow, also operate on both.

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[44] 271 U.S. at 602-03.

[45] Ernst Freund develops the idea as to workmen's compensation statutes in a note to *Booth Fisheries Co.* v. *Industrial Commission*, 271 U.S. 208 (1926), in *Illinois Law Review*, XXI (1926), 385. "Election" to make a local official an agent to accept service in Massachusetts was predicated upon a Pennsylvania automobilist's use of the Massachusetts highways in *Hess* v. *Pawloski*, 274 U.S. 352 (1927). But the court rejected an argument that a utility had "elected" a statutory procedure which would bar timely recourse to the federal judiciary against confiscatory rates in Railroad, etc. *Commission* v. *Duluth Street Railway*, 273 U.S. 625 (1927).

[46] A. A. Bruce, writing in *Illinois Law Review*, XXI (1926), 380, considers the case an example of federal centralization of business control by use of the Fourteenth Amendment. Mr. Justice Brandeis indicates his sense of the magnitude of the problem thrust upon society's regulatory forces by the motor vehicle business. Some thirty-eight states have sought legislation to cope with it. The Duke and Frost cases show the hurdles set by the due process clause; the commerce clause furnished additional hurdles. See *Buck* v. *Kuykendall*, 267 U.S. 307 (1925); *Bush Co.* v. *Maloy*, 267 U.S. 317 (1925); *Interstate Busses Corporation* v. *Holyoke Street Railway*, 273 U.S. 45 (1927); *Minnesota Law Review*, XI (1927), 157; *Harvard Law Review*, XL (1927), 882.

[47] See Adler, supra note 4; Burdick, supra note 34.

The occasion was the railroads' test of the Adamson Law,[48] in Wilson *v.* New.[49] The act was there sustained; but, while the statute was no regulation of labor in the sense of putting pressure upon the labor factor in railroad enterprise, since it actually granted a wage increase, thus operating upon the property ingredient, the opinion included some provocative language. Mr. Chief Justice White, speaking for the Court, said:

> That the business of common carriers by rail is in a sense a public business because of the interest of society in the continued operation and rightful conduct of such business and that the public interest begets a public right of regulation . . . is settled. . . . And this leaves only to be generally considered whether the right to exercise such a power under the conditions which existed was limited or restrained by the private rights of the carriers or their employees.

He found no difficulty of course, in the regulation of the carriers' contracting power; but

> As to the employee . . . whatever would be the right of an employee engaged in a private business to demand such wages as he desires, to leave the employment if he does not get them, and, by concert of action, to agree with others to leave upon the same condition, such rights are necessarily subject to limitation when employment is accepted in a business charged with a public interest . . . and the resulting right to fix, in case of disagreement and dispute, a standard of wages, as we have seen, necessarily obtained.[50]

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[48] For the history of the statute see Bonney, "Federal Intervention in Labor Disputes," *Minnesota Law Review*, VII (1923), 467, 551. See also *Harvard Law Review*, XXX (1917), 739.

[49] 243 U.S. 332, 347 (1917). See Burdick, "The Adamson Law Decision," *Cornell Law Quarterly*, II (1917), 320; Powell, "The Supreme Court and the Adamson Law," *University of Pennsylvania Law Review*, LXV (1917), 607.

[50] In *Adair* v. *United States*, 208 U.S. 161 (1908), the Court held unconstitutional an act preventing an interstate carrier from discharging em-

The Kansas experiment in new public enterprises was supported by its proponents upon this decision[51] in its aspect as an attempt to secure continuity of operation of public utilities as against the labor ingredient. The Kansas court said:[52]

> Heretofore the industrial relationship has been tacitly regarded as existing between two members—industrial manager and industrial worker. They have joined whole-heartedly in excluding others. The legislature proceeded on the theory there is a third member of those industrial relationships which have to do with production, preparation and distribution of the necessaries of life—the public. . . . Whenever the dissensions of the other two become flagrant, the third member may see to it the business does not stop.

Since the legislation had been particularly designed to cope with cessation in the fuel industry,[53] the Kansas strategy which brought the scheme on for the Supreme Court's imprimatur in the vehicle of a threatened strike in a packing plant, considering the possible advantages of riding into court upon a case involving coal, may be questioned. In addition, the test was made not only on a packing plant but on a wage-setting and hours of labor order fought by the plant owner and not by the labor.[54] It was on such examples that the whole experiment collapsed.

Mr. Chief Justice Taft in the first Wolff case,[55] after saying that "The avowed object is continuity of food, clothing and fuel supply," continued:

> (It) involves a more drastic exercise of control to impose limitations of continuity growing out of the public character of the business upon the employee than upon the employer; and without saying that such limitations upon both may not be sometimes justified, it must be where the obligation to the public of continuous service is direct, clear and mandatory and arises as a contractual condition express or implied when investment by the owner and entering the employment of the worker create a conventional relation to the public somewhat

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ployees because of union membership. Mr. Justice McKenna (who concurred in *Wilson* v. *New*) there dissented, saying "(The statute presents) a well coördinated plan for the settlement of disputes . . . and (prevention of) strikes and . . . derangement of business. . . . I submit no worthier purpose can engage legislative attention. . . ." 208 U.S. at 184.

[51] See Young, supra note 23, 207.

[52] *State* v. *Howat*, 109 Kans. at 417, 198 Pac. at 705.

[53] Rabinowitz, supra note 23, lays the background which made the legislation a political possibility in Kansas.

[54] "H. M. B(ates)," writing in *Michigan Law Review*, XXII (1923), 135, discusses the mistake in tactics in testing the Kansas Act with a case so weak for the purposes of the state.

[55] Supra note 24.

equivalent to the appointment of officers and the enlistment of soldiers and sailors in military service. . . . The power of a legislature to compel continuity in a business can only arise where the obligation of continued service by the owner and its employees is direct and is assumed when the business is entered upon. . . . It is not too much to say that the ruling in Wilson *v.* New went to the borderline. . . . Certainly there is nothing to justify extending the drastic regulation sustained in that exceptional case to the one before use.[56]

The Kansas Industrial Court decisions might be explained on the ground that compulsory arbitration, generally, is barred,[57] or on the alternate ground that the statute failed because the enterprises were not accepted as ''public.'' Whether they leave compulsory arbitration constitutional in accepted ''public Utilities'' generally, or only in public utilities when they are big enough, and what degree of bigness is enough, and whether the doctrine is only for emergencies and what they are, and whether only the Federal Government may do anything about enforcing continuance, and then only on interstate commerce grounds, remain open questions. As an inquiry into the special duties, if any, of the personnel devoting its effort to the service of public utility enterprises, not connected with interstate commerce, this line of approach toward even a theoretical discussion of labor's obligations seems blocked. So far as Kansas is concerned the experiment has ended, for the statute has been repealed and the court abolished.[58]

70. The Meaning of Public Utility—A Sociological Interpretation *

The use of the term ''public utility economics,'' . . . suggests that there is a sector in the industrial field which is readily distinguishable, the economics of which may be separately treated.

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[56] 262 U.S. at 541, 543, 544.

[57] On compulsory arbitration see Simpson, *Harvard Law Review,* XXXVIII (1925), 753, discussing *Wilson* v. *New*, and the first Wolff case. The same author wrote a note on the second Wolff case in *Harvard Law Review,* XXXVIII (1925), 1097. It is also noted in *Michigan Law Review,* XXIV (1925), 60.

[58] See Huggins, "Just what has the Supreme Court done to the Kansas Industrial Act? Why did it do it?" *American Bar Association Journal,* XI (1925), 363; and "The Province of Law and Order in the Realm of Industry," *Ohio Law Bulletin,* XXIV (1926), 557. The author of these articles was presiding judge in the court and drafter of the statute creating it.

* Excerpts from article by Martin G. Glaeser—"The Meaning of Public Utility—A Sociological Interpretation," *Journal of Land and Public Utility Economics,* I (1925), 176-188.

. . . The term "public utility" is one of recent coinage. In fact, the dictionaries, encyclopedias of law, and other works of reference have no discussion of the subject-matter under this heading. Years of observation of the unconscious use of the term by people generally has led me to conclude that it is being used as a generic term to cover only the local utilities such as gas, water, telephone, electric, and street-railway utilities. Recent works relating to this general subject-matter have used the term in this restricted sense.[1] However, when attention is called to the logical possibility of comprising within the term railways, the telegraph, express companies, and so forth, no objection can usually be urged against such an enlargement of its meaning. We find, then, that the scope of the term, public utility, is both broad and narrow with a great variety of interpretations between the two limits. If we would orient public utility economics, it becomes necessary to determine what meaning of the term is correct, and what standards shall be used in reaching our conclusion. . . .

No one has done more to explain in detail the nature of the law governing public employments than has Professor Bruce Wyman. But it was the genius of Dean Roscoe Pound that first saw the central principle running through this long historical development and which was preserved by the peculiar character of the common law. In his illuminating lectures on the "Spirit of the Common Law," he distinguishes its two characteristics. One is its extreme individualism; the other is its treatment of individuals as members of a group.

It is the second characteristic which is of importance to us here. Quoting Dean Pound's own words: "On the other hand, it is characterized by another element tending in quite another direction: a tendency to affix duties and liabilities independently of the will of those bound, *to look to relations rather than to legal transactions* as the basis of legal consequences, and to impose both liabilities and disabilities upon those standing in certain relations as members of a class rather than upon individuals."

His explanation of this characteristic is that it represents the feudal element in our law and is in its origin due to the fact that when the common law was in process of formation, the principal social and legal institution of the time was the feudal relation of lord to man. "Here the question was not what a man had undertaken or what he had done but what he was. The lord had rights against the tenant and the tenant had rights against the lord. The tenant owed duties of service and homage or fealty to the lord and the lord owed duties of defense and warranty to the tenant. And these rights existed and these duties were owing simply because the one was lord and the other was tenant. The rights and duties belonged to that relation. Whenever the existence of that relation put one in the class of lord or the class of tenant, the rights and duties existed as a legal consequence. The first solvent of individualism in our law and the chief factor in fashioning its system and many of its characteristic doctrines was the analogy of this feudal relation; suggesting the juristic conception of rights, duties, and liabilities arising, not from express undertaking, the terms of any transaction, voluntary wrong-doing or culpable action, but simply and solely as incidents of a relation. . . ."

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[1] See W. H. Maltbie, *Theory and Practice of Public Utility Valuation* (New York: McGraw-Hill Book Company, Inc., 1924); M. L. Cooke, *Public Utility Regulation* (New York: The Ronald Press, 1924); C. S. Morgan, *Regulation and The Management of Public Utilities* (Cambridge: The Riverside Press, 1923); Lamar Lyndon, *Rate-Making for Public Utilities* (New York: McGraw-Hill Book Co., Inc., 1923).

It must be clear that public utility enterprise exhibits a strange mixture of volition and compulsion. Compulsion was characteristic of feudal times, while persuasion was the touchstone of laissez-faire. The legal rights and duties to be observed by individuals toward each other in feudal times flowed as a result of the *relations* that individuals bore to each other, whereas in the freer atmosphere of laissez-faire the rights and duties were a result of express undertakings or *contracts*. The public utility institutions, originating in feudal times and as modified by laissez-faire doctrines, combine the compulsory affixing of rights and duties as a consequence of "relation" with the *voluntary* procedure of entering upon contractual obligations. Persons are free to enter upon a public service enterprise, but having entered upon an undertaking of this character they are constrained by its peculiar system of rights and duties. Persons are free to consume the products or use the services of a public utility or not as they choose, but having voluntarily agreed to take such service, they are bound by its peculiar system of rights and duties. Thus, volition and compulsion are combined in the elaboration of a scheme which collectively constitutes the law of public service companies.

There are many types of undertakings the relationships with which, either as producer or consumer, bring legal consequences as described above. The nature of the institution itself—the complex of legal rights and duties—is singularly fixed and unvarying. It is an institution not solely of economic significance but also one of large political importance; for while, on the one hand, it is concerned with the material needs of individual economic life, it serves, on the other hand, to strengthen and make possible socio-economic life. Out of its institutional character arises the public interest in its maintenance and development.

From this point of view the term public utility does not refer specifically to an industry, but it becomes the collective name for a whole group of industries. It is a highly abstract conception of certain relationships embracing certain definable rights and duties. What the medieval jurist, as well as the modern jurist, means when he says that certain employments are public employments is this: that the objects of property engaged therein are "affected with a public interest" and that he wants these employments to be cast within the mold of relationships which will insure their successful prosecution. If one would understand the nature of the institution, one must understand the rights and duties which compose it. If one would understand the rights and duties, one must understand the public interests which those rights and duties are to conserve. If one would understand why the conservation of these public interests should become a matter of rights and duties, molded and enforced by the state, one must understand the process of social evolution. The state lends to the institution the coercive power of its sovereignty. It is not without significance that some modern French writers have discussed even the state itself in terms of a great public service corporation.

What is the precise nature of this peculiar system of rights and duties? A public utility is under the extraordinary duty to render service to all who apply. Persons engaged in private business are at liberty to refuse to serve any or all. Moreover, to those in private business, their own private interest and the ability of customers to seek out others are assumed to be self-corrective for any failure to provide adequate service. Again, a public utility is required to serve up to the limit of its capacity, where capacity is more and more being defined, not as mere physical capacity, but as the limit of profitableness. It may not let customers' wants go unsatisfied. Nor may it attach unreasonable conditions to contracts for service so as in effect to negative its duty "to serve all comers." Furthermore, it must serve without discrimination all customers similarly circumstanced. Finally, a public utility must observe more than ordinary care in the rendition of service in view of the generally hazardous nature of the circumstances surrounding the service and the dependence of the public upon such care.

On the other hand, the law concedes the public utility the right to withdraw service under certain conditions, but after giving notice to customers. Customers are given the reciprocal right to demand that a public utility live up to its duties and are, on the other hand, required to accept reciprocal obligations. Such in general terms are the rules of law outlining the rights and duties of public utilities toward their patrons.

71. The Rights of the Utility Under Commission Regulation *

That the state has the right to provide for any public utility regulation within the valid exercise of its police power, cannot be denied. This has become a fixed principle of law applicable to the regulation of public utilities.

The extent and definition of ''police power'' presents a greater difficulty. The limits and definition of said power change with the spirit of the time. It is extended or restricted according to the temper of the electorate.

Mr. Justice McKenna, in the case of Eubank *v.* Richmond,[1] well states the difficulties of defining police power, in the following:

> Whether it is a valid exercise of the police power is a question in the case, and that power we have defined, as far as it is capable of being defined by general words, a number of times. It is not susceptible of circumstantial precision. It extends, we have said, not only to regulations which promote the public health, morals and safety, but to those which promote the public convenience or the general prosperity. Chicago, Burlington and Quincy Railroad Co. *v.* Illinois.[2] And further, "It is most essential of powers, at times the most insistent, and always one of the least limitable of the powers of government." District of Columbia *v.* Brooke.[3]

In this day of elastic state constitutions, of referenda and initiatives, it is an easy matter to pass state legislation, which will define, limit or extend the police power of the state as the popular will may dictate.

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* Excerpt, Franklin T. Griffith, *Report of the Forty-Fifth Annual Meeting of the American Bar Association* (Baltimore: Lord Baltimore Press, 1922), pp. 675-688.

[1] 226 U.S. 137, 142; 57 L. Ed. 158.

[2] 200 U.S. 561; 50 L. Ed. 596; 26 Sup. Ct. Rep. 341; 4 Ann. Case 1175.

[3] 214 U.S. 138, 149; 53 L. Ed. 941-945; 29 Sup. Ct. Rep. 560.

Hence, it is of little avail for the utility to urge in the state courts that a particular regulation is beyond the police power of the state, for, if the state court should so hold, it is probable that, at the next election, such constitutional or statutory legislation would be adopted as to substantially define and extend the police power of the state to include the protested regulation.

In those states which have by their constitutions kept separate the three departments of government, the commission is regarded as an administrative branch of the executive department. The purpose of the commission is to give force and effect to laws as enacted by the legislative department. Hence, when any attempt is made to clothe the commission with judicial power as well; to pass upon the validity of its own rulings, there arises an admixture of departmental jurisdiction, which should not be sustained. As said by Judge Hood in Western Union Telegraph Co. *v.* Myatt:[4]

> In prescribing regulations or rules of action under the police power of the state for the safety and convenience of the public or determining a schedule of rates and charges for services to be rendered, they (the Commission) are in no sense performing judicial functions, nor are they in any respect judicial tribunals. The distinction between legislative and judicial functions is a vital one, and it is not subject to alteration or change either by legislative act or by judicial decree, for such distinction inheres in the constitution itself, and is as much a part of it as though it were definitely defined therein. When the legislature has once acted, either by itself or through some supplemental and subordinate board or body, and has prescribed a tariff of rates and charges, then, whether its action is violative of some constitutional safeguard or limitation, is a judicial question, the determination of which involves the exercise of judicial functions. The question is then beyond the province of legislative jurisdiction.

Nearly every question which could be raised on behalf of the utility is a federal question under the Fourteenth Amendment of the Constitution of the United States. If the regulation is fair and reasonable, the objection of the utility thereto is without merit; if the regulation is such that it confiscates the property of the utility, or denies it equal protection of the laws, then it is unreasonable, and comes within the prohibitions of the said Fourteenth Amendment and a federal question is thus presented, of which the federal courts have jurisdiction. Appreciating the spirit of the electorate of the different states, and having studied and contrasted the course of judicial procedure and decision in state and federal courts, we are irresistibly led to the conclusion that a public utility will gain earlier and more effective results by resorting directly to the federal courts for injunctive relief whenever such a course is possible.

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[4] 98 Fed. 335, 341.

The first question which the attorney for the utility must determine is, whether or not he is compelled to seek relief in the state courts before resorting to the federal courts. The answer to this question depends upon the construction and interpretation of the state legislation, under which the regulation had been promulgated. If the state legislation provides for the exclusive remedy of appeal to the state courts, then that course should be followed. This question was before the Supreme Court of the United States in the case of Prentis et. al. *v.* Atlantic Coast Line Co.,[5] wherein Mr. Justice Holmes says:

> The State of Virginia has endeavored to impose the highest safeguards possible upon the exercise of the great power given to the State Corporation Commission, not only by the character of the members of the commission, but by making its decisions dependent upon the assent of the same historic body that is intrusted with the preservation of the most valued constitutional rights, if the railroads see fit to appeal. It seems to us only a just recognition of the solicitude with which their rights have been guarded, that they should make sure that the state, in its final legislative action, would not respect what they think their rights to be, before resorting to the courts of the United States.
>
> If the rate should be affirmed by the supreme court of appeals and the railroads still should regard it as confiscatory, it will be understood from what we have said that they will be at liberty then to renew their application to the circuit court, without fear of being met by a plea of *res judicata*. It will not be necessary to wait for a prosecution by the commission. We may add that when the rate is fixed, a bill against the commission to restrain the members from enforcing it will not be had as an attempt to enjoin legislation, or as a suit against a state and will be the proper form of remedy. . . .
>
> But if the state statute discloses that the remedy of appeal to the state court is only an alternative remedy, then resort should be had to injunctive relief in the federal courts without the delay incident to a proceeding in the state courts. Bacon *v.* Rutland R. R. Co.[6]

The history of the development of our law, whereby the utility is given protection under the Fourteenth Amendment to the Federal Constitution, is interesting.

The leading early case is that of Munn *v.* Illinois.[7] The question there at issue was, whether the State of Illinois could regulate warehousemen in the handling of grain. This was one of several cases known as the "Granger cases." The state took the position that the business to be regulated was a public business, subject to the police powers of the state; that the regulation thereof was lodged in legislative discretion; that this discretion could not be disturbed by the courts. The warehousemen contended that the Fourteenth Amendment gave them protection against enforcement of the regulations.

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[5] 211 U.S. 210, 230; 53 L. Ed. 150, 160.

[6] 232 U.S. 134, 58 L. Ed. 538.

[7] 94 U.S. 113, 154, 24 L. Ed. 77, decided in 1877.

The court, in an opinion by Mr. Justice Waite, Mr. Justice Field dissenting, upheld the contentions of the State of Illinois, and decided that (1) the legislature had power to fix rates of public business; (2) that such rates were within the sole discretion of the legislature and could not be changed by the courts.

The importance of this decision was at once recognized, and the law journals as well as the press of that day, have interesting comments upon the decision. These comments are critical or otherwise, dependent upon the interests which might be reflected. Those journals which were presumed to represent invested capital, denounced the decision in no uncertain terms. The *New York Times,* in an editorial of March 29, 1877, referred to the decision as "mischievous," and argued that, under such a rule, the investment of foreign capital could not be expected. Evidently the investing public had something of the same idea, for railroad stocks and bonds declined immediately following the announcement of the decision.[8]

If the decision in the Munn case had been allowed to stand, public utilities would to-day have little or no protection, and would be subject to the arbitrary will or whim of every succeeding legislature and regulatory commission.

Mr. Chief Justice Waite himself was the first to suggest a modification of the doctrines of the Munn case. In the case of Stone *v.* Farmers Loan and Trust Co.,[9] decided in 1885, Mr. Chief Justice Waite, in discussing the Munn case, says:

> From what has thus been said, it is not to be inferred that this power of limitation or regulation is itself without limit. This power to regulate is not a power to destroy, and limitation is not the equivalent of confiscation. Under pretense of regulating fares and freights the state cannot require a railroad corporation to carry persons or property without reward; neither can it do that which in law amounts to a taking of private property for public use without just compensation, or without due process of law.

[8] 9 Rose's Notes 510.

[9] 116 U.S. 331, 29 L. Ed. 644.

In 1889, in the case of Chicago, Milwaukee and St. Paul Railroad Company *v.* Minnesota,[10] the Munn doctrine was again under consideration. This case arose on writ of error to review the judgment of the Supreme Court of Minnesota, which had held that rates published by the Minnesota Railroad and Warehouse Commission were final and conclusive, and that the reasonableness thereof could not be inquired into.

The court, in an opinion by Mr. Justice Blatchford, expressly overruled the doctrine of the Munn case in the following language:

> The construction put upon the statute by the Supreme Court of Minnesota must be accepted by this court, for the purposes of the present case, as conclusive, and not to be reëxamined here as to its propriety or accuracy. The supreme court authoritatively declared that it is the expressed intention of the Legislature of Minnesota, by the Statute, that the rates recommended and published by the Commission, if it proceeds in the manner pointed out by the act, are not simply advisory, nor merely *prima facie* equal and reasonable charges; that the law neither contemplates nor allows any issue to be made or inquiry to be had as to their equality or reasonableness in fact; that, under the statute, the rates published by the Commission are the only ones that are lawful, and therefore in contemplation of law the only ones that are equal and reasonable; and that, in a proceeding for mandamus under the statute there is no fact to traverse except the violation of law in not complying with recommendations of the Commission. In other words, although the railroad company is forbidden to establish rates that are not equal and reasonable, there is no power in the courts to stay the hands of the Commission, if it chooses to establish rates that are unequal and unreasonable. This being the construction of the statute by which we are bound in considering the present case, we are of opinion that, so construed, it conflicts with the Constitution of the United States in the particular complained of by the Railroad Company. It deprives the company of its right to a judicial investigation, by due process of law under the forms and with the machinery provided by the wisdom of successive ages for the investigation judicially of the truth of a matter in controversy, and substitutes therefore, as an absolute finality, the action of a railroad commission which, in view of the powers conceded to it by the state court, cannot be regarded as clothed with judicial functions, or possessing the machinery of a court of justice.

That the court intended to overrule the Munn case is shown by the dissenting opinion of Mr. Justice Bradley, wherein he says:

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[10] 134 U.S. 456, 33 L. Ed. 980.

> I cannot agree to the decision of the court in this case. It practically overrules Munn *v.* Illinois.[11]

In 1893, the same court had the question before it in the case of Reagan *v.* Farmers Loan & Trust Co.,[12] and, in an opinion of Mr. Justice Brewer, held:

> The courts are not authorized to revise or change the body of rates imposed by a legislature or a commission; they do not determine whether one rate is preferable to another, or what under all circumstances would be fair and reasonable as between the carriers and the shippers; they do not engage in any mere administrative work; but still, there can be no doubt of their power and duty to inquire whether a body of rates prescribed by a legislature or commission, is unjust and unreasonable, and such as to work a practical destruction to rights of property, and, if found so to be, to restrain its operation.

Since the Reagan case, the Supreme Court has repeatedly affirmed the proposition that public utilities are entitled to protection under the provisions of the Fourteenth Amendment, and if regulation by commissions, in their effect upon utilities, are violative of the provisions of said amendment, then the utility, by injunctive proceedings in the federal courts, or by writs of error to review the decision of Supreme Courts, may have relief from such regulations.

While it had been definitely settled that the utility would be protected from actual confiscation of property there still remained the question whether the utility, under the Fourteenth Amendment, could compel rates which would give it a reasonable return. It had taken fifteen years to modify the Munn decision so as to prevent actual confiscation of utility properties, and it was a long stride in reversal for the same court to go farther and give the utility the aid of the Fourteenth Amendment in compelling rates which would insure the utility a reasonable return upon the investment.

But twenty-one years after the Munn decision, in 1898 in the case of Smyth *v.* Ames,[13] the precise question arose. Mr. William J. Bryan, for the Appellants, admitted the right of judicial interference when the rates prescribed resulted in actual confiscation, but denied the right of judicial interference to secure an adequate or any return to the utility. Mr. Bryan states his contention as follows:

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[11] 94 U.S. 113.

[12] 154 U.S. 392, 38 L. Ed. 1914.

[13] 169 U.S. 466, 42 L. Ed. 819.

> That, as a general rule, the power of the courts to suspend the enforcement of a schedule of rates fixed by a state legislature or by a railroad commission can only be invoked when such rates yield an income so small as to leave absolutely nothing above operating expenses.

The court in an opinion by Mr. Justice Harlan, after an exhaustive review of prior decision, held:

> In view of the adjudications, these principles must be regarded as settled. . . . A state enactment, or regulations made under the authority of a state enactment, establishing rates for the transportation of persons or property by railroad, that will not admit of the carrier earning such compensation as under all the circumstances is just, to it and to the public, would deprive such carrier of its property without due process of law, and deny to it the equal protection of the laws, and would therefore be repugnant to the Fourteenth Amendment of the Constitution of the United States."

The Smyth-Ames case has been repeatedly cited with approval, and it is now the settled law of the land that a public utility may, under the protection of the Fourteenth Amendment, compel such rates as will enable the utility to make a fair and reasonable return upon a fair and reasonable investment.

72. Charters as Contracts *

The inviolability of contract obligations was early recognized as a categorical imperative without which peaceful and orderly government could not exist. It served as the handmaiden of property right which has for ages been held almost as sacred as life itself, and for the violation of which the penalty was frequently death. Guarantees of the fulfillment of contract obligations and the preservation of property rights were therefore written into the United States Constitution and in terms which leave little doubt that one was considered as precious as the other; that, in fact, a right arising from a contract is a property right.

The first clause of Section 10, Article I, of the United States Constitution provides among other things that no state shall pass any law impairing the obligation of contracts. While this prohibition runs only against the several states and not against

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* Excerpt, Louis Roth (of the Staff of the New York Public Service Commission—First District), "Effect of Regulation on Contract Obligations," *The Utilities Magazine*, II (November, 1917), 9-13.

the Federal Government itself, the makers of the Constitution left no doubt of the intent that the Federal Government should adhere to this rule of reason, by providing in Article VI as follows:

> I. All Debts contracted and Engagements entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

Moreover, the Fifth Amendment to the United States Constitution, which is one of the ten safeguards against encroachment by the Federal Government upon the liberties and rights of its subjects, often termed the "Bill of Rights," provides that "No person shall be . . . deprived of life, liberty or property without due process of law; nor shall private property be taken for public use, without just compensation." The same prohibition in almost identical words was incorporated in the New York State Constitution (Art. I, Sec. 6) as well as in the constitution of other states.

It is patent, however, that no orderly government can exist without subjecting the citizens and their liberties to certain restrictions or regulations. In a free government such restrictions are imposed upon the citizens by their own general consent without jeopardizing, but rather for the purpose of safeguarding, the unhindered enjoyment of the liberties and rights remaining to them. License is exchanged for liberty because the latter is insecure where the former holds sway. The regulation of natural persons in a democracy is therefore said to be exercised by and with the consent of such persons—government by and with the consent of the governed. The authority emanates from those who created the government or by whose will it exists.

The basic foundation for the regulation of public utilities is to be found in the same law, acting differently upon different conditions. Unlike a natural person, a corporation is not the creator but the creation of government. It exists with the consent of the government which reserves the right to repeal its charter. Having such right, the government which created the corporation may so regulate it as to make it conform to the purposes for which it was created and to impose such restrictions as will promote the welfare of the people whom it is intended to serve. In the intent of the law the corporation can exist only for the benefit of the people and not the people for its benefit. Corporations not being persons are not, therefore, possessed of the so-called rights of life, liberty and the pursuit of happiness, and such constitutional guarantees are not applicable to them. But even corporations may not have their property confiscated, as such prohibition is not limited to the protection of *persons* only, and the prohibition against the enactment of state laws impairing the obligation of contracts serves equally to protect corporations as well as individuals.

Society is an extremely complex organism and few pronouncements of law, whether embodied in the organic law or in statutory enactment, are so happily worded as to be capable of easy and satisfactory construction under all circumstances without judicial decree. Nor does a judicial determination, even of the highest court in the land, always carry the conviction that absolute justice has been done to all contending parties. A very interesting case, in which the United States Supreme Court itself admitted that its decision might work an injustice to one of the contestants, is here recited.

E. L. Mottley and his wife, Annie E., were seriously injured in 1871 in a collision of trains belonging to the Louisville and Nashville Railroad Company engaged in interstate operation. The claim for damages was settled by an agreement granting to Mottley and his wife free passes renewable annually and during their several lives, in lieu of all money damages. The Mottleys continued to ride on such passes for nearly forty years when, in 1909, the company refused any longer to renew such passes under authority of an amendment to the Interstate Commerce Act, passed June 29, 1906, the so-called Hepburn Act. This act so amended the prohibition against discrimination already contained in the Act of 1887 as to forbid not only the collection of a greater or less, but also of a *different,* fare than that provided in the tariff schedules required to be filed with the Commission. The effect of this amendment, it was contended, was to prohibit the acceptance of anything but a cash fare or a ticket issued for cash. The plaintiffs, Mottleys, secured a verdict in the Circuit Court of the United States for the Western District of Kentucky,[1] but upon an appeal to the United States Supreme Court the lower Court was reversed by a decision rendered February 20, 1911,[2] and the Mottleys were left without redress, as their right to an action for damages had long expired.

In rendering a verdict against the plaintiffs the Court, in the opinion of Mr. Justice Harlan, said (at p. 474):

[1] 150 Fed. Rep. 406.

[2] 219 U.S. 467.

> It may be, as suggested, that a refusal to enforce the agreement of 1871 will operate as a great hardship upon the defendants in error. But that consideration cannot control the determination of this controversy. Our duty is to ascertain the intention of Congress in passing the statute upon which the railroad company relies as prohibitive of the further enforcement of the agreement in suit. That intention is to be gathered from the words of the act, interpreted according to their ordinary acceptation, and, when it becomes necessary to do so, in the light of the circumstances as they existed when the statute was passed. Platt *v.* Union Pacific R. R. Co., 99 U. S. 48, 64. The court cannot mould a statute simply to meet its views of justice in a particular case. Having in the mode indicated, ascertained the will of the legislative department, the statute, as enacted, must be executed, unless found to be inconsistent with the Supreme Law of the Land.

Citing various cases in support of its decision the Court continued (at p. 482):

> Long before the above cases were decided it was said in Knox *v.* Lee, 12 Wall. 457, 550, 551, that "as in a state of civil society, property of a citizen or subject is ownership, subject to the lawful demands of the Sovereign, so contracts must be understood as made in reference to the possible exercise of the rightful authority of the Government, and no obligation of a contract can extend to the defeat of legitimate government authority."
>
> These principles control the decision of the present question. The agreement between the railroad company and the Mottleys must necessarily be regarded as having been made subject to the possibility that, at some future time, Congress might so exert its whole constitutional power in regulating interstate commerce as to render that agreement unenforceable or to impair its value. That the exercise of such power may be hampered or restricted to any extent by contracts previously made between individuals or corporations, is inconceivable. The framers of the Constitution never intended any such state of things to exist.

One can't help feeling that the ends of justice required that some reparation should have been made to the Mottleys, whose loss, though perhaps not great, was brought about by a judicial construction of legislation intended, in the words of Justice Harlan, "to cut up by the roots every form of discrimination, favoritism and inequality" (p. 478), but which, at least in this case, had the effect of benefiting the corporation at the expense of two individuals whose contract rights, in the practical sense, had not only been impaired, but completely wiped out. The legislation was, nevertheless, consonant with true principles of equity worthy of a democratic form of government, that the same treatment should be accorded to all, and, in lieu of a more material balm, even the Mottleys might have taken comfort from the knowledge that the law has worked a great deal more good than harm. That this is true is at least attested by the fact that similar provisions have been enacted into law in various states and that they have withstood the onslaught made upon them.

Numerous decisions have been handed down by state commissions that rates fixed by contract between public utility corporations and their customers are subject to regulation and that, although such contracts were entered into prior to the existence of any regulatory legislation, they were, nevertheless, made in contemplation that legislation might be enacted at some future time which would tend to modify the contract rates. Thus, the California Railroad Commission held[3] that it had the power to reduce the rate for water fixed by contract with a municipality when such rates were excessive. The Commission cited numerous court decisions in support of its determination that the power of the state to regulate rates was based upon the police power (Munn *v.* Illinois[4]) that such power could not be contracted away by a municipality (Knoxville Water Co. *v.* Knoxville[5]) and that the constitutional prohibition against impairing the obligation of contracts did not apply (Chicago, Burlington and Quincy R. R. Co. *v.* Nebraska[6]).

The power of the state to regulate public service corporations is co-extensive with the need for regulation to make the service efficient, and no entangling alliances will be permitted to stand in the way of the desired result. All such power may, moreover, be delegated by the state to its agent, the Public Service Commission. Pursuant to such delegation of authority the Missouri Public Service Commission ordered the discharge of a manager of a water company on account of discourteous, unfair and insulting treatment of the patrons of the company.[7] The Commission held:[8]

> There can be no doubt but that the Commission has full and complete power, authority and jurisdiction, not only over public service corporations coming within its jurisdiction but over their officers, agents, servants, and employees, and may order the discharge of either after a hearing given the public service corporation, either on complaint or on motion of the Commission. Of course the Commission

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[3] *Town of Sausalito* v. *Marin Water & Power Co.*, 8 California Commission Reports, p. 252, decided October 6, 1915.

[4] 94 U.S. 113.

[5] 189 U.S. 434.

[6] 170 U.S. 57.

[7] *In the Matter of the Complaint of J. J. Cole et al.* v. *The Fort Scott and Nevada Light, Heat, Water & Power Co.*, 1 Mo. P.S.C.R. 130, decided November 17, 1913.

[8] Pages 180-181.

should wisely exercise such power and jurisdiction, but to deny such authority, would take from the public one of the essential protections and securities sought to be given to it by the legislature of this state in the passage of the Public Service Commission law, and the placing of supervision and regulation of the public service corporations of this state and the acts of their officers, agents and employees under the Commission.

Franchise rates, *i.e.* the rates named in the franchise contracts obtained from local authorities, have generally been held to be subject to the powers vested in the state public utility commissions to regulate rates. Where such power to regulate rates exists, the rates may be regulated upward as well as downward. The right to regulate the rates upward was asserted by the Massachusetts Public Service Commission in the Middlesex and Boston Rate Case,[9] upon an application by the company to increase the fare on its street-railways from five to six cents. The Chamber of Commerce and other civic bodies appearing in opposition to the application contended that as the franchise-granting authorities had fixed the fare on some of the lines at five cents the company was precluded from charging more than five cents on such lines. This contention was not sustained by the commission, who said:

> . . . that any alleged conditions or limitations as to fares contained in original grants of locations or growing out of agreements or attempted agreements between municipal authorities and the petitioning railway company or any of its antecedent constituent corporations are not valid and controlling as against the rate-making power now vested in this Commission by the Public Service Act.

That rates fixed by franchise contract may, on the other hand, be regulated downward was upheld by the Supreme Court of Wisconsin [10] upon an appeal by the Duluth Street Railway Company against a decision of the Wisconsin Railroad Commission. The facts in the case were as follows:

The Duluth Street Railway Company held a franchise from the City of Superior which authorized it to charge "such rates of fare for the transportation of passengers or freight over its lines of railway as it may deem proper" and established a maximum fare of five cents "over any continuous line operated as such." Upon complaint of the Commercial Club of the City of Superior the Wisconsin Railroad Commission required the company to sell six tickets for twenty-five cents. The company contended that the Commission had no authority to issue an order impairing the company's rights under the franchise contract with the City of Superior, especially because its rights were preserved by an act of the legislature [11] repealing the charter of the City of Superior and enacting a new one which provided that the repeal should "not in any manner affect, injure or invalidate any existing contract, act or suit, claims, penalties or demands that may have been entered into, performed or commenced by the village (or city) of Superior."

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[9] Mass. P.S.C.R. 1914, Vol. I, p. 105, decided October 28, 1914.

[10] *Duluth Street Railway Co.* v. *Railroad Commission of Wisconsin*, 152 N.W. Rep. 887, decided June 1, 1915.

The Court, reviewing the Commission's decision, held that the city's power to make a rate-regulating provision in a franchise contract could not have been in abrogation of the legislative prerogative to regulate rates; that the enactment of 1891 preserved to parties under contract with the city only such rights which the city could grant, but that as the city could not have granted away the rate-regulating powers of the legislature, the legislature did not, by the act of 1891, confer upon the company such powers which it did not hold under contract with the city, and that the Commission, as the agent of the legislature, could order a decrease in rates.

Similarly, the Public Service Commission for the First District, New York, ordered a reduction in the fare on the Williamsburg Bridge [12] from three cents and two tickets for five cents to two cents and three tickets for five cents, respectively, although the higher fares were authorized by a contract between the company and the Department of Bridges, which was executed in May, 1904, three years before the enactment of the Public Service Commissions Law, and which was not to expire until September 1, 1914, or nearly two years after the rate reduction was put into effect.

An interesting decision was rendered by the New York Public Service Commission for the Second District in the application of the New York and North Shore Traction Company to increase its rate of fare on the line between Mineola and Port Washington from ten cents to fifteen cents.[13] Ten cents was the fare fixed by the local franchise. The commission held that it had no power to authorize an increase above the franchise rate fixed by the local authorities, as the fare fixed by them was to be regarded as a condition attached to the local consent for the construction and operation of a street-railway, and that such consent was necessary under the New York State Constitution [14] before the company could acquire any valid rights in the public streets for street-railroad purposes. To rule otherwise, the Commission held, would nullify the constitutional provision prohibiting the grant of any franchise for street-railroad purposes without the consent of the local authorities.

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[11] Chapter 124, Laws of 1891.

[12] Rates of the Bridge Operating Co., 3 P.S.C.R. (1st Dist. N. Y.) 226, decided April 10, 1912.

[13] Application of N. Y. and North Shore Traction Co., 4 P.S.C.R. (2nd Dist. N. Y.) 587, decided Sept. 8, 1915.

Upon a review of the decision of the Public Service Commission for the Second District, in the above case, the Appellate Division for the Third Department held [15] that Sections 1 and 18 of Article 3 of the State Constitution must be read together, and that while under Section 18 the legislature is prohibited from authorizing the construction or operation of a street-railroad except upon condition that the consent of the local authorities be first obtained, under Section 1 of the same article, in the words of Mr. Justice Lyon, who wrote the opinion of the Court, "the local authorities are prohibited from attaching conditions to the consent which assume to regulate the rate of fare for the reason that the right to regulate fares charged by public service corporations is essentially a legislative function." [16] The matter was sent back to the Commission for a rehearing and a number of rate increases were granted.

In this connection it may be said that it is the general practice of local authorities in New York State to stipulate in the franchise grants to street-railroad corporations what fares shall be charged. Such stipulations, it appears, are of no effect to limit the companies' rates as a condition of the franchise grant except where the rates are not determined by the legislature or its agent, the Public Service Commission.

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[14] Art. 3, Sec. 18. The provision reads—"No law shall authorize the construction or operation of a street railroad except upon the condition that the consent of the owners of one-half in value of the property bounded on, and the consent also of the local authorities having the control of that portion of a street or highway upon which it is proposed to construct or operate such railroad be first obtained."

[15] *People ex rel. New York & North Shore Traction Co.* v. *Public Service Commission*, 175 A.D. 869, decided December 28, 1916.

[16] Section 1 of Art. 3 provides: "The legislative power of this state shall be vested in the senate and assembly."

73. The Origin of the Rule Against Unjust Discrimination *

Side by side with the common law obligation of public servants to render service to all who apply and to render such service for reasonable compensation, there admittedly now exists in America, apart from statute, the obligation to serve without unjust discrimination either in the matter of rates or of service; while in England, in rates at least, and probably in the matter of service, the same duty prevails. The two former obligations are of early origin, dating back to the Year Book times, and have been recognized for centuries. As to the last, the few modern writers and cases which have entered upon an investigation of its origin are at variance both as to whether or not such a duty existed at the common law, and, if not, as to the precise time when it made its appearance. It has been regarded by some as an ancient common law doctrine of which the early statutes were merely declaratory, and passed "in abundance of caution" merely to affirm "the common right to equal justice which exists independent of such provisions,"[1] while others have considered it a wrong recently recognized, but have frequently disagreed as to the exact date of its origin.[2] . . .

The Origin of the Rule in America. The earliest case dealing with this rule in America is Fitchburg Railroad *v.* Gage,[3] a case decided by the Supreme Court of Massachusetts in 1859. In that case an action was brought by a railroad company for the recovery of freight charges upon certain goods shipped by the defendant. The defendant objected to the amount of the charges, not upon the ground that they were inherently unreasonable or excessive, but because freight was carried for others for a lower rate under similar circumstances. . . .

. . . In this . . . case the rule was laid down that no common law prohibition of unjust discrimination existed, and it was assumed that the common law of England was in accord; although the precise state of the English law at that time was not indicated in any reported case, and no authority upon that point was cited. . . .

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* Excerpts from B. M. Kline, *University of Pennsylvania Law Review and American Law Register*, LXVI (1918), 123-156.

[1] Per C. J. Lewis, in *Sandford* v. *Railroad Co.*, 24 Pa. 378 (1855). "The supposed necessity for such provisions in charters granted in this country and in England, proves nothing more than that the lawmakers of both countries were aware of the difficulty in holding large corporations to those common obligations of justice which individuals feel bound to acknowledge without legislative enactment."

[2] Bruce Wyman, *Public Service Corporations* (1911), Vol. II, Sec. 1282.

[3] 12 Gray (Mass.) 393 (1859).

The case usually cited as the earliest departure from the rule announced in Fitchburg Railroad *v.* Gage, and the one generally supposed to have first laid down the rule against unjust discrimination in America, is Messenger *v.* Pennsylvania Railroad,[4] decided by the Court of Errors and Appeals of New Jersey in 1874. A shipper of goods sued to recover certain rebates on goods shipped which the railroad had promised to remit. The court refused recovery, saying that a common carrier could not legally give "unequal preferences," and said that this rule had been laid down by the cases at common law in America. The precise ground of decision in the early cases involving the rights of express companies upon railroads, before referred to, here becomes important, as this leading early decision relies upon the authority of these previous cases, which involved an entirely distinct obligation, as the sole authority for the rule that it announced.[5] The court concludes that at common law there is "necessarily implied a duty on their (the carriers') part, and a right in the public, to have fair treatment and immunity from unjust discrimination."

Although the Messenger Case is quite generally cited as the turning point in the American common law, at which it departed from the rule of the Gage Case, a common law rule prohibiting unjust discrimination had, in fact, become well established in America several years earlier. It is rather notable that none of the earlier cases except those involving the rights of express companies were cited by the court to sustain its conclusion, since there existed authorities perfectly opposite that were not referred to. . . .

The first case in America in which the question was squarely raised and the rule against unjust discrimination laid down is Twells *v.* Pennsylvania Railroad,[6] decided by the Supreme Court of Pennsylvania in 1863. That this early case dealing with the problem was not cited in the later cases wherein the identical problem was treated as *res nova* in the American law, is probably due to the fact that either through accident or because it was marked "not to be reported" it was omitted from the

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[4] 8 Vroom (N.J.) 531 (1874).

[5] *New England Express Co.* v. *Maine Central R.R. Co.*, 57 Me. 188 (1869); *McDuffee* v. *R.R.*, 52 N.H. 430 (1873); *Sandford* v. *Railroad*, 24 Pa. 378 (1855). The court also cited *Audenried* v. *P. & R. R.R.*, 68 Pa. 370 (1871) which is not an "express" case and only by a very general dictum supports the decision.

[6] 2 Walker (Pa.) 450 (1863).

Pennsylvania reports of that year, and it was first made available upon the publication of Walker's collection of unreported cases in 1890.

The railroad had established a higher rate from Pittsburgh to Philadelphia upon freight sent by the complainant which was intended for further shipment to New York, a point beyond its terminus, than when Philadelphia was its final destination. It was not contended that the higher charge was inherently unreasonable; it was merely urged that the fact that the ultimate destination of the freight was beyond the carrier's line did not create a dissimilarity of circumstances upon which an inequality of rates could properly be predicated. The court held that the discrimination was unjustifiable. After enumerating some of the duties of common carriers, Mr. Justice Strong concludes with the mention of the duty to transport "at rates of compensation that are alike to all." . . .

The next case involving the rule also arose in Pennsylvania, one year later.[7] Here the complaint was that the railroad charged a lower rate on freight shipped from Pittsburgh to Philadelphia than it charged for an identical service when the freight started from a point outside the state, in this case, at Wheeling. The discrimination was a part of a general policy on the part of the railroad to facilitate the movement of intrastate commerce, since the State of Pennsylvania had imposed a tonnage tax upon freight originating within that state, the effect of which was to place Pennsylvania shippers at a serious disadvantage in competing markets. The avowed purpose of the rate difference in this case was to compensate for the tonnage tax and place the local shippers upon an equal footing with those outside the state boundaries.

The difference in rates was upheld by the court. . . . So far as the usual justifications of discrimination are concerned, such as variances in the cost of service or competition, the difference in rates here sustained was entirely capricious and arbitrary. Yet in the decision of the court the rule against unjust discrimination is clearly recognized. Citing Sandford *v.* Railroad,[8] the earliest of the "express" cases, the court holds that the English "equality clauses" were merely declaratory of the common law, and says that there is implied in the power given the carrier to establish reasonable rates the requirement that these rates must be "fixed, equal, and impartial." In holding that this discrimination in favor of local traffic was justified, the court said that while equality under the same circumstances was required, a discrimination based upon the place of production of the commodity was not necessarily an unjust one.

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[7] *Shipper* v. *P. R.R.*, 47 Pa. 388 (1864).

[8] 24 Pa. 378 (1855).

There is discernible in this case the conservative attitude, corresponding to that of the early English courts, in adopting a strict and narrow application of the requirement of equality. The distinction is made between unequal treatment of individuals and of localities. It is quite natural that the injustice of the former should have been first recognized. . . . Even today, under modern statutes, competition may justify a discrimination between localities; between individuals, it cannot. . . .

The next case which involved the rule appeared in Illinois four years later.[9] A statute of that state made it unlawful for a railroad company to deliver grain at any warehouse other than the one to which it was consigned, without the consent of the owner or consignee. The railroad, while delivering grain at a certain other warehouse without additional charge, demanded five dollars per car in addition to the regular rate for delivery at the warehouse of the plaintiffs. A petition for an injunction against the exaction of this charge was granted. The bill contained an averment that the charge for delivery was intrinsically excessive and unreasonable, but the court in its opinion did not advert to the inherent reasonableness of the rate. It said: "As to the right of the company to impose the extra charge of five dollars, on the ground that it is performing additional service, it need only be said that a railway company, although permitted to establish its rates of transportation, must do so without unjust discrimination as to individuals," and enjoined the carrier from "imposing upon them (the plaintiffs) an additional charge for such delivery, beyond what it imposed upon other warehousemen." Here again the broad rule against unjust discrimination is laid down; and again the case is treated like one of first impression, none of the earlier cases or dicta being cited.

In the year 1870 two cases of importance in tracing the origin of the rule were decided, one of them by the Supreme Court of Pennsylvania, reported in the *Legal Gazette* of that year and not included in the official reports.[10] In this case Mr. Justice Agnew charged that the carrier was bound to carry the coal of the complainant at a rate as low as the carrier was at the same

[9] *Vincent v. The Chicago & Alton R.R.*, 49 Ill. 33 (1868).

[10] *Coal Co. v. Railroad Company*, 2 Legal Gazette (Pa.) 149 (1870).

time charging the "most favored operators" for coal carried between the same points. While accepting the rule as a common law proposition, the court held that it did not preclude the possibility of a minimum charge, which was a discrimination founded upon sound principles and not unjust.

In the same year Chicago and Northern Railway *v.* People,[11] an Illinois case, presents the first instance in America where the problem of discrimination in the matter of facilities as distinguished from rates, was raised. The complaint was that the railroad had refused to deliver grain in bulk at the elevator of the plaintiff, while it made such deliveries for others, and a mandamus was sought to compel delivery at the plaintiff's elevator. Since a statute had rendered such delivery obligatory, as indicated in the Vincent Case,[12] it is questionable whether that portion of the court's opinion dealing with the common law upon the subject of unjust discrimination can rise to a higher dignity than dicta. The court, while recognizing the effect of the statute, is emphatic in its opinion that independently of this legislative direction, an equivalent common law obligation would exist. . . .

It is noteworthy that the court did not seek to enforce the duty as a part of the carrier's "duty to serve" but emphasized the discriminatory feature, the fact that service was accorded to others similarly situated. As the first clear case of discrimination in facilities in America, this decision occupies an important place in the history of the origin of the rule against unjust discrimination.

The constitution adopted in Illinois in 1870 empowered the general assembly to pass laws to prevent "unjust discrimination" by railroads.[13] In Chicago and Alton Railroad *v.* People,[14] in 1873, Mr. Chief Justice Lawrence held that an act providing for equal charges for equal distances was prohibitive of all differences and not merely of "unjust discriminations" as the constitution had authorized; but it was further stated that since unjust or unreasonable discrimination was prohibited by the common law, subject to which all railroad charters were accepted, the charter rights of the railroad would not be infringed nor the contract impaired by an act prohibiting unjust discrimination.

From the foregoing analysis it is apparent that the common law rule prohibiting unjust discrimination had become established in America several years prior to the Messenger Case in

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[11] 56 Ill. 365 (1870).

[12] *Supra*, Note 9.

[13] Art. XI, Sec. 15.

[14] 67 Ill. 11 (1873).

1874.[15] Curiously enough, however, in the Messenger Case none of this earlier authority is referred to, and the only authorities therein cited stand for an entirely different principle.

It was about this time that the clamor for regulation and legislative enforcement of the rule arose. One by one the states adopted legislative measures varying in severity and efficiency, which were immediately lauded and denounced respectively by the opposing schools of economists. However well established the common law prohibition against unjust discrimination may have been, practical difficulties in its application and enforcement created the demand for a more efficient method through the avenue of legislation. One fact, however, is to be emphasized, as it is commonly overlooked or denied. It was not due to any defect in the theory of the common law that the need for a statutory remedy arose. The American common law had developed a perfectly efficient theory, which has been taken over, uniformly in substance and frequently in its precise phraseology, the term "unjust discrimination," in the modern statutes. It was rather the inadequacy of the common law processes and the absence of any such administrative tribunals as the commissions of today for the enforcement of the duty in complicated situations, that created the need for legislation. . . .

While the rule against unjust discrimination was growing up at common law, some courts were arriving at the desired end by an indirect method. If two shippers under identical or substantially identical circumstances are given unequal rates, the natural inference is that the lower rate is remunerative and that therefore the higher must be excessive. This is not necessarily true. But it was quite natural that where such an inequality was shown to exist it should be accepted by the courts as some evidence, at least, that the rate exceeded the privilege of reasonable compensation. It was likewise natural that there should have been a desire on the part of some courts to enforce the right to equal treatment through the obligation to serve for reasonable compensation, a duty long established and universally recognized, rather than through the medium of the rule against unjust discrimination, more recent of origin and of more dubious ancestry. As early as the case of McDuffee *v.* Railroad,[16] in 1873, it was said by way of dictum that such inequality might be evidence tending to show that the higher charge was excessive. This suggestion was seized upon by several courts which, though reluctant to accept the lately recognized common law rule against unjust discrimination, sometimes out of deference for the early English dicta, were nevertheless anxious to reach its result, even by indirection. The climax of what might be called the legal hypocrisy of this attitude, is reached in Cook *v.* Chicago, etc., Railway,[17] where, after stating that inequality of charges is only evidence to show that the higher rate is unreasonable, which is a perfectly legitimate inference, and after further quoting authorities to the effect that no obligation to refrain from unjust discrimination exists at common law, the court cites with approval Redfield on *Law of Railroads*[18] to the effect that "carrying for reasonable compensation must imply that the same compensation is accepted always for the same service, else it could not be reasonable, either absolutely or relatively." It concludes that the only finding that can in fairness be made is that, after deducting the rebate, the rate was reasonable. Thus the court, in its zeal to enforce equality of rates, had given what was originally a bit of evidence the force of a conclusive presumption. The reasoning is ridiculous. . . . It is in the field of relative equality that the rule against unjust discrimination has its application. It were far better if the court had recognized this and accepted the rule. . . .

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[15] *Messenger* v. *P. R.R.*, *supra*, note 4.

[16] 52 N.H. 430 (1873).

In spite of all this authority to the contrary, some courts even in recent times have declared that no common law obligation to refrain from unjust discrimination exists. . . .

Of these decisions, that in Johnson *v.* Pensacola Railroad[19] is the earliest and easily the most carefully considered. In this case lower rates on lumber were given to certain shippers in consideration of certain money lent to the railroad and a certain volume of shipping supplied. A shipper sued to recover the amount of freight he had paid in excess of what he would have paid under the rates allowed favored shippers. After citing the Gage Case and approving the statement therein that the common law obligation of carriers extends to the reasonableness of the rates only, and not to their equality, the court, in distinguishing the Messenger Case, was careful to say that there unequal rates were prohibited under the same circumstances, while in this case the declaration did not allege that the conditions were identical. The court further said that for all that appeared in this case the difference in rates might be justified by the amount of freight to be furnished by the parties, or other circumstances might render the conditions dissimilar, and upheld the discrimination. As a makeweight to bolster up its decision from the point of view of practicability, the court pointed out the inconvenience of a rule whereby a shipper who was unfairly treated might look about to discover the most favored shipper and recover according to the difference in the rates given them; the extent of the recovery would in effect be determined by the success attending such a search. Aside from the fact that the difficulty of arriving at a practicable measure of damages is not insuperable, and should not prevent the enforcement of a right to equality, if public policy recommends it, would the court have compelled by mandamus the imposition of equal rates in the future, if requested? In that case, at least, the practical objection would not be present. . . .

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[17] 81 Ia. 551 (1890).

[18] Isaac F. Redfield, *Law of Railroads* (Boston: Little Brown and Company, 4th ed., 1869), Vol. II, p. 95.

[19] 16 Fla. 623 (1878)

Another case often referred to as supporting the doctrine of the Gage Case clearly came to the opposite conclusion.[20] A section of the Colorado constitution prohibited "undue and unreasonable discrimination" by railroad companies, yet under it a contract allowing rebates to a favored shipper was upheld. It was said that it did not constitute unjust discrimination because it was not an exclusive contract and did not in terms prevent the allowance of similar privileges to others; and the specious distinction between a favor allowed to an individual which is denied to others, and denying a certain individual privileges which others are permitted to enjoy, was apparently approved. But although it cited the Tennessee, Florida, and South Carolina cases heretofore referred to, the court also recognized the rule prohibiting unjust discrimination, and the Messenger Case, even though it may not have properly applied it. Nowhere, perhaps, is the confusion inevitably resulting from the use interchangeably of the terms "discrimination" and "unjust discrimination," better illustrated. In arriving at the conclusion that absolute equality was not imperative the courts found little difficulty. Certain differentiating circumstances would justify a difference or inequality. This absence of any obligation to preserve an absolute equality came to be termed, loosely, the right to "discriminate," and it was inaccurately stated by some courts that there was no rule against "discrimination." This confusion of "justifiable discrimination" with "unjust discrimination," resulting from the designation of both by the appellation, "discrimination," frequently led to the belief that the door to all kinds of discrimination had been opened. It is true that the Gage

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[20] *Bayles* v. *Kansas Pacific Ry.*, 13 Colo. 181 (1889).

Case, with full knowledge of the consequences, went to that extent. But most of the cases which have purported to follow it lay down a much narrowed principle.

As late as 1892 the Supreme Court of California was confronted with a case of rebating accompanied by no justifying circumstances, and held that such conduct was not prohibited by the common law.[21] The court recognized the divergence of opinion upon the subject in America, . . . but . . . preferred to follow the early English view. At this time, however, the rule (against discrimination) had become firmly established in America, having the support of a great wealth of authority.[22] This may be mentioned as one of the few American cases which accept to the full extent the doctrine of the Gage Case.

The case of Lough *v.* Outerbridge,[23] decided in an important commercial jurisdiction, has been confidently cited by courts and writers who adhere to the view of the Gage Case. It becomes important, therefore, to consider the ground of that decision. A certain steamship company offered a reduced rate to all who would patronize their ships exclusively while a competitor's ship was in port. This privilege was extended to all shippers under the same conditions. The court held that a shipper who patronized both the carrier in question and his competitor could not insist upon the lower rate. While the Gage Case was quoted by the court, the language of Mr. Justice O'Brien leaves beyond doubt the basis of the decision. He said: "If the general rates are reasonable a deviation from the standard by the carrier in favor of particular customers, for special reasons, not applicable to the whole public, does not furnish to parties not similarly situated any just grounds for complaint. When the conditions and circumstances are identical the charges to all shippers for the same service must be equal." The decision was arrived at on the ground that the rebate offered was not exclusive but was available to all upon the same conditions, and because the presence of competition justified this regulation on the part of the carrier. That the rule was fully accepted in New York is further indicated by a decision of the Court of Appeals of that state five years earlier in which the right of a carrier to make unjust discriminations either in service or in rates was denied.[24]

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[21] *Cowden* v. *Pacific Steamship Co.*, 94 Cal. 470 (1892).

[22] *Concord & Portsmouth R.R.* v. *Forsaith*, 59 N.H. 122 (1875); *Houston, etc., Ry.* v. *Rust.*, 58 Tex. 98 (1882); *Scofield* v. *Railway Co.*, 43 Ohio 571 (1885); *I. D. & S. R.R.* v. *Ervin*, 118 Ill. 250 (1886); *Fitzgerald* v. *Grand Trunk Ry.*, 63 Vt. 169 (1890). For a modern case containing an extensive review of the subject, see *Mo. K. & T. Ry.* v. *New Era Milling Co.*, 80 Kan. 141 (1909).

[23] 143 N. Y. 27 (1894)

From the entire investigation it may safely be concluded that there grew up in America a common law doctrine prohibiting unjust discrimination as early as 1863. While legislation to define and enforce the obligation appeared here much later than in England, the American courts had embodied the substance of what has become the modern statutory obligation into a common law rule. It represents a natural expansion of the obligations of public servants to satisfy a demand and correct an abuse which were the creatures of new and increasingly complicated conditions.

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[24] *Root* v. *L. I. R.R. Co.*, 114 N. Y. 300 (1889). In this case an interesting situation is presented. A rebate on freight was offered in consideration of the erection by the shipper of a dock which the railroad could use. A suit for the recovery of the rebates was successful. The court said that while the rebate standing alone would amount to an unjust discrimination, since it was founded upon valuable consideration the contract would be enforced. The custom of giving rebates for consideration of indefinite value such as that in this case, later developed into a convenient cloak for unjust preferences, and the tendency of the courts under modern statutes is to frown upon it. At this time, however, it was held legitimate.

CHAPTER VI

REGULATION OF PUBLIC SERVICE INDUSTRIES

74. Early Regulation of Public Service Corporations *

The regulation of public service corporations has assumed such importance in recent years that there is general disposition to consider it a modern method of securing justice between the public and corporations. A study of early public utility companies and the laws dealing with them warrants no such conclusion. The service of these companies to the public was recognized from the first and was given as one reason for granting charters. As early as 1784 Massachusetts lawmakers incorporated the proprietors of a bridge company because the bridge would be of ''great public utility.''[1] That the companies were looked upon to some extent as public benefactors, did not, however, grant them immunity from regulatory provisions. The early companies were, of course, comparatively simple, consisting largely of turnpike, canal, bridge, and ferry companies. Yet in the regulatory provisions concerning them are found the germs, if not the actual statements, of practically all our present methods of regulation.

The present machinery for regulating public utility companies is of course more extensive and adequate than what existed in the latter part of the eighteenth and the early part of the nineteenth centuries. The work is now usually carried on through public utility commissions. These began to be formed about the middle of the nineteenth century, but did not assume their present activities until a quarter of a century later. Only recently have state public utility commissions been formed, New York and Wisconsin almost simultaneously taking the lead. The movement has spread so rapidly that a majority of the states now have such commissions. The commissioners generally receive power from the legislature, which is either that of general supervision or an enumeration, of special and particular powers. Provision

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* M. H. Hunter, "The Early Regulation of Public Service Corporations," *American Economic Review*, VII (1917), 569-581.

[1] Laws and Resolves of Massachusetts, 1784, Chap. 53.

is often made for judicial review. Salaries are paid by the political unit which the commission represents.

A commission of some form was generally used in supervising the early public utility corporations. Position on the commission was secured by appointment, but not all members were appointed by the same authority. Some commissions were temporary and others were permanent, while a limit was often placed upon the amount of time which could be allowed to the commission for its services. Instead of being recompensed directly from the public funds, as at present, the earlier commissioners were paid directly by the corporation.

In 1803 a New York law [2] incorporated a turnpike company and provided that the governor should appoint three commissioners to examine the road from time to time. Each commissioner was to be paid three dollars a day by the corporation, but the inspection was not to exceed two days a month. An 1804 turnpike law [3] provided for inspection on complaint. If the company or complainant was dissatisfied with the finding of one commissioner, appeal could be made to the whole board, whose decision was final. If unappealed, and the complaint was well founded, the corporation was to pay the inspector three dollars a day as well as three dollars to the complainant; if not well founded, the complainant was to pay the inspector. If appealed, and the complaint was still considered well founded, the corporation was to pay the complainant ten dollars. In 1806 a law [4] provided that if the complaint was unfounded the corporation was to collect, at law, from the complainant the amount paid to the inspectors. In 1806 [5] provision was made for the appointment of appraisers and inspectors by the county judge. For the first service the judge was to receive one dollar from the corporation, likewise for the second unless the complaints investigated were unfounded, in which case the complainant was to pay the one dollar. Many of these provisions were incorporated in a general law in 1807 which provided for the appointment of commissioners to lay out the road [6] and others to inspect it, both of which were to be paid specified amounts by the corporation.

Other states besides New York handled the problem in a similar way. In the Laws and Resolves of Massachusetts for 1804 [7] there is an act defining the general powers of turnpike companies. Provision was made for the legislature to appoint a committee to view the route proposed by the petitioners for a road. When a grant was made for a road, the court of general sessions of the peace within the county where the road was located was to appoint five disinterested freeholders who were to have the same powers as committees appointed for laying out public highways. All the expenses of the committeemen were to be borne by the corporation. In 1806 [8] North Carolina gave the county court powers to regulate bridge companies within certain limits. Pennsylvania in 1783 [9] permitted ferries to be established subject to such regulation as the legislature considered best. By a law of Vermont, 1808,[10] the judges of the supreme court were to direct the examination of a bridge company and could reduce tolls. In 1820 [11] she gave the village selectmen broad powers in regulating a ferry. In 1817 [12] Virginia conferred regulatory powers upon the board of public works, but provided that the legislature might confer the same powers upon any other body.

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[2] New York Statutes, 1803, Chap. 50.

[3] *Ibid.*, 1804, Chap. 90.

[4] *Ibid.*, 1806, Chap. 170.

[5] *Ibid.*, 1806, Chap. 50.

[6] *Ibid.*, 1807, Chap. 38.

[7] Laws and Resolves of Massachusetts, 1804, Chap. 125.

These examples show that the principle of regulation was recognized from the beginning. In some cases new machinery was created while in others use was made of bodies already existing, such as legislature, courts, and selectmen. In taking note of some of the more specific forms which this regulation assumed, it will be convenient to classify present regulation into provisions for supervising—(1) franchises and officers, (2) valuation and rates, (3) security issues, (4) service and property, (5) accounts and reports—and then to examine these, noticing briefly the scope covered by each at present but more especially the early regulatory provisions that would fall in each class.

Franchises and Officers. One of the first duties which was placed on the public utility commission after it was formed was to select the location for railroads in accordance with public utility. The regulation of granting and using franchises is often extended to the commission. Laws often contain regulatory provisions, such as prohibiting the capitalization of franchises, while provision is sometimes made for their purchase and termination. Penalties are frequently prescribed against officers for failure to make reports, for failure to produce books, for refusal to obey subpœnas and for granting concessions to commissioners.

In view of the importance now attached to the subject of the length and termination of franchises, it is interesting to note the early provisions of this nature, their wide extent, and the number of ways in which franchises could be terminated. Massachusetts, in the general turnpike law of 1804,[13] stipulated that a company could be dissolved if it appeared to the satisfaction of the legislature that the income had compensated the company for money expended together with 12 per cent interest. The property, in case of dissolution, was vested in the commonwealth and at the disposal of the legislature. Connecticut, in 1806,[14] declared that upon neglect to make repairs the charter of the company was to be declared void. By a law of Maryland, 1801,[15] when a road had been remunerated for its capital stock, together with 15 per cent on it and for all damages it had met, tolls were to cease forever. In 1803[16] the legislature provided that all above 15 per cent received by a bridge company should be kept as a sinking fund to purchase the stock. A law the next year[17] provided that if the profits of a turnpike company were more than 10 per cent the court was to receive the surplus and use it in purchasing all the road. The general assembly could at any time after the completion of the road, one year's notice having been given to the company, pay the cost of the road with interest at 10 per cent, whereupon the road would pass under the control of the legislature. In 1820,[18] New Jersey incorporated a canal company which could be taken over at the end of fifty years by paying the sum expended together with 12 per cent interest.

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[8] Laws of North Carolina, 1806, Chap. 14.

[9] Laws of Pennsylvania, 1783, Chap. 1042.

[10] Laws of Vermont, 1808, Chap. 63.

[11] *Ibid.*, 1820, Chap. 113.

[12] Laws of Virginia, 1817, Chap. 38.

The earlier provisions in Massachusetts were less considerate of the companies. The Law of 1784[19] simply provided that at the end of forty years the bridge to be erected by the company was to revert to the state. Nothing was stated about a return or price; nor was there any such statement in the Law of 1787[20] permitting the erection of a bridge which was to revert to the state in good repair at the end of seventy years. The road company incorporated by the state in 1796[21] could be dissolved by the general court when it was satisfied that the tolls had paid expenses together with 12 per cent interest. Pennsylvania granted both perpetual and terminable franchises. In 1787,[22] a bridge company was formed, but at any time after the erection of the bridge, the legislature, if it considered a free bridge desirable, was to appoint three commissioners, who, with three appointed by the proprietors of the bridge, were to decide upon the amount to be given in payment. In 1793,[23] an act vested the property of a bridge in the company or their heirs forever. A turnpike, granted in 1796,[24] could be purchased after twenty-five years for a sum determined by ten commissioners, five to be appointed by the legislature and five by the company. All profits above 15 per cent from the bridge established in 1798 [25] were to be used as a sinking fund to redeem the bridge, When the toll from the road chartered by Vermont in 1799 [26] amounted to the cost of the road with an annual interest of 12 per cent, the supreme court might dissolve the corporation and place the property at the disposal of the legislature.

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[13] Laws and Resolves of Massachusetts, 1804, Chap. 125.

[14] Acts and Laws of Connecticut, 1806, p. 717.

[15] Laws of Maryland, 1801, Chap. 23.

[16] *Ibid.*, 1803, Chap. 103.

[17] *Ibid.*, 1804, Chap. 51.

[18] Laws of New Jersey, 1820, p. 55.

[19] Laws and Resolves of Massachusetts. 1784, Chap. 53.

[20] *Ibid.*, 1787, Chap. 27.

[21] Laws and Resolves of Massachusetts, 1796, Chap. 53.

[22] Laws of Pennsylvania, 1787, Chap. 1302.

Similar provisions are found in charters granted in the first quarter of the nineteenth century. Vermont, in 1808,[27] chartered a turnpike company but provided that when receipts had repaid expenditure with 8 per cent interest the corporation was to be dissolved and the property vested in the state. Virginia, however, granted perpetual franchises. The general turnpike law of 1817 [28] provided that, in consideration of the expenses of the proprietors, roads with all tolls and profits were to be vested in the proprietors forever in proportion to their shares. This state even went further and declared the shares free from public tax. Provision was made, however, that if a road were out of repair for eighteen months the interest of the company in the road and tolls was to be forfeited forever. South Carolina, also, in one instance, at least, because of the great cost to the proprietor, vested a road in him and his posterity forever.[29]

Early provisions regarding franchises are not confined to eastern states but are also found in laws of some of the middle western states. Illinois territory, in 1818,[30] chartered a navigation company. In consideration of the expense, the works and the profits from the enterprise were vested in the company for thirty years, but at the end of that time all title was to cease. During this period no tax was to be collected from the company. In 1812 [31] Ohio gave a charter to a bridge company for ninety-nine years. If higher tolls were charged, however, than those set forth in the schedule, the county was to have all rights of proprietorship. In 1817,[32] a turnpike company was incorporated, and it was provided that at any time the state or counties had a right to purchase the road for its cost plus 12 per cent. A law of 1819 [33] authorizing a bridge company gave the county commissioners power to purchase the bridge, 6 per cent interest to be allowed.[34]

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[23] *Ibid.*, 1793, Chap. 1684.

[24] *Ibid.*, 1796, Chap. 1878.

[25] *Ibid.*, 1798, Chap. 1963.

[26] Laws of Vermont, 1799, p. 38.

[27] *Ibid.*, 1808, Chap. 117.

[28] Laws of Virginia, 1817, Chap. 38.

[29] Laws of South Carolina, 1810, p. 37.

[30] Laws of Illinois Territory, 1817-1818, p. 4.

[31] Ohio Laws, 1812, Chap. 22.

The early provisions referring to officers and employees were not many; yet we find the possibility of such regulation recognized in a few instances. Maryland, in 1804,[35] provided that the court could require road repairs and if these were not made in proper time the president of the road was to be fined. Massachusetts, in 1780,[36] provided for a suitable person to collect toll who must be approved by the court of general sessions. He was to be fined for collecting more than specified toll. Delaware, by a law of 1815,[37] provided that a toll collector who demanded more than scheduled rates should forfeit twenty-five dollars. Maryland, in 1801,[38] made the penalty for a similar offense fifty dollars.

Valuation and Rate Making. Valuation and rate making occupy important places in present regulation problems. Reasonable freight rates are required, with but little light on what ''reasonable'' means. ''Value of service,'' ''what the traffic will bear,'' and ''cost of service'' have been used as bases for rate fixation, the odds at present favoring the last. Commissions are given power to deal with a large number of problems which arise concerning rates, while legislatures prescribe penalties for a long list of offenses. In allowing certain returns the value of the utility must be determined and as yet no general method has proved entirely satisfactory.

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[32] Ohio Laws, 1817, Chap. 13.

[33] *Ibid.*, 1819, Chap. 13.

[34] A number of instances can be found where the rights of these companies reverted to the political unit. A careful study of the documents of different states and counties would doubtless show a large number. It seems the proprietors were not always willing to give up their rights. An example of this is the Charles River Bridge and the Warren Bridge at Boston. Here the proprietors resorted to litigation. A number of House Documents refer to this controversy, *e.g.*, No. 4, 1826, and No. 82, 1827. The laws of the state, 1828, p. 510 and p. 851, also refer to the controversy. The resolves of 1824, Chap. 64, authorize the ascertainment of the reversionary value of some bridges. A number of years later some states changed the provisions for purchasing roads.

[35] Laws of Maryland, 1804, Chap. 51.

[36] Laws and Resolves of Massachusetts, 1780, Chap. 7.

[37] Laws of Delaware, 1815, Chap. 45.

[38] Laws of Maryland, 1801, Chap. 23.

Inspection of the early laws reveals that the subject of valuation and rate making occupied a scarcely less important place then than at present. Most of the rates were fixed by schedule while they were often to be changed to allow a certain percentage return on the value of the property. Massachusetts as early as 1780[39] stipulated certain rates of toll for a bridge. In 1784,[40] a bridge company was organized with a schedule of tolls to continue in force for forty years. Two bridge companies were incorporated in 1794.[41] In the case of one the general court could change the rate of toll after twenty-five years. In 1804,[42] she established a schedule of tolls for all turnpike companies.

Maryland, in 1804,[43] made provision that if at the end of two years the average profits had not been 10 per cent the tolls were to be increased until this return should be realized. By a law of 1807[44] the New Hampshire court was to so regulate tolls that net profits would be between 6 and 9 per cent. New Jersey, when incorporating a canal company in 1820,[45] required one fifteenth of all profits to be paid to the state whenever the return was more than 15 per cent on the capital. Pennsylvania laws of 1787, 1791, and 1792[46] incorporated a bridge company and two canal companies. Schedules of tolls were given which were to be revised if the return was more or less than a certain per cent on the capital. In 1810, 1812, and 1819[47] Ohio incorporated bridge companies. A schedule of tolls was given in each case. In the first case any legislature could regulate the tolls after 1840; in the second, after fifteen years and once every five years thereafter; in the last case any legislature after 1840 could regulate the tolls. A Virginia law of 1808[48] allowed tolls to bring 10 per cent on the capital, while a law of 1817[49] permitted higher tolls during the first years of a company's existence. After fifty-one years, however, tolls could only vary so as to realize a return of from 6 to 10 per cent on capital.

Securities. The supervision of security issues is looked upon as one of the newer forms of regulation and the laws of some states are exacting in this respect. In some cases the mortgaging of public utility property is regulated; in others the purchasing and holding of stocks and bonds in other companies is supervised. Often consolidations can be formed only under the direction of a commission, penalties being prescribed for issuing stocks and bonds other than with its consent.

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[39] Laws and Resolves of Massachusetts, 1780, Chap. 7.

[40] *Ibid.*, 1784, Chap. 53.

[41] *Ibid.*, 1794, Chaps. 32 and 33.

[42] *Ibid.*, 1804, Chap. 125.

[43] Laws of Maryland, 1804, Chap. 51.

[44] Laws of New Hampshire, 1807, p. 8.

[45] Laws of New Jersey, 1820, p. 55.

[46] Laws of Pennsylvania, 1787, Chap. 1302; 1791, Chap. 1577; 1792, Chap. 1636.

[47] Laws of Ohio, 1810, Chap. 65; 1812, Chap. 22; 1819, Chap. 67.

[48] Laws of Virginia, 1808, Chap. 27.

[49] *Ibid.*, 1817, Chap. 38.

The security aspect of regulation did not assume an important place in early legislation. Trusts and combinations were unknown and there was no interdependence among companies. Yet even in the early laws are found germs of the policy that the state has a right to supervise a company's securities. Connecticut, in a general turnpike law of 1803,[50] stipulated that all expenses except for necessary and ordinary repairs were to be met by an increased capital stock. Even the three dollars a day paid to commissioners was to be raised in this way. By a law of 1805,[51] however, no deficiency of interest could be charged to capital. North Carolina incorporated a bridge company in 1812 [52] and prohibited any person from subscribing to more than twenty shares within thirty years after the books were opened. Pennsylvania in 1792 [53] forbade the increase of capital stock unless the authorized capital did not complete the canal chartered or unless it was injured through casualty.

Service and Property. At present we are accustomed to a variety of regulations affecting the services and property of public utility companies. Some laws require particular appliances and equipment; others give commissions power to make such requirements. Penalties are prescribed for failure to carry out the various kinds of service requirements. The sale and lease of property is often supervised, while damages to other property caused by a public utility company are assessed and awarded by commissioners. Additions, extensions, repairs, etc., are often required to be made to the existing plant.

Some provision concerning service to be rendered is generally found in the early laws which chartered turnpike and bridge companies. The right to collect tolls was frequently based upon the maintenance of a required standard of service. As early as 1796 [54] Massachusetts placed a fine upon companies for unreasonable delay of travelers, while in 1802 [55] she made the companies liable for all damages resulting from defects in the road. The general turnpike law of 1804 [56] provided that a corporation should be fined if any person in its employ should collect more toll than allowed by law. If a road was not kept in good condition, the county court could order gates to be thrown open and no toll could be collected until a counter order was given. In 1797,[57] a Connecticut law required the county court to inquire into any complaint as to the condition of the road. If the complaints were well founded tolls were to cease until a further order from the court. In the general law of 1803 the commissioners were required to carefully inspect the roads annually or more often if "they thought the public good required it." If they were not found in good repair the commissioners could order toll gates thrown open until acceptable repairs were made. North Carolina, Rhode Island, and Ohio at later dates had similar provisions. North Carolina, in 1811,[58] made the proprietor liable for damages if he failed to keep the road in repair. No person was to be detained at any gate longer than fifteen minutes after he had tendered toll. Rhode Island, in 1812,[59] gave the justices of the county court power, upon complaint which they thought well founded, to order the gates opened until proper repairs were made. Ohio chartered a bridge in 1812[60] stipulating that for every offense of not keeping it in repair the company was to forfeit five dollars.

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[50] Acts and Laws of Connecticut, 1803, p. 636.

[51] *Ibid.*, 1805, p. 691.

[52] Laws of North Carolina, 1812, Chap. 26.

[53] Laws of Pennsylvania, 1792, Chap. 1636.

[54] Laws and Resolves of Massachusetts, 1796, Chap. 5.

[55] *Ibid.*, 1802, Chap. 34.

[56] *Ibid.*, 1804, Chap. 125.

Accounts and Reports. Regulation of accounting methods and securing reports of different kinds occupies an important place in the present relation of the public utility companies. The Interstate Commerce Commission requires accounts and reports from the railroads. Some states make the same requirements for companies within the state; others prescribe systems of their own. Provisions are generally made for examining and auditing accounts under direction of commissioners, and specific forms are often required. Free access to a company's books is generally required, penalties being inflicted for mutilation of books or failure to keep in the prescribed manner.

In the early laws no less emphasis was placed upon the right of the public officers to supervise accounts and demand reports. These provisions, as is true of most of the other regulatory provisions, were usually first found in laws dealing with specific companies. When a general law was enacted they were incorporated in it. That these specific provisions were made general is evidence that they accomplished the purpose for which they were intended. Here again Massachusetts was early in requiring such regulation. The act of 1780,[61] which chartered a bridge company, required the proprietor to keep an account of the tolls received and exhibit this under oath to the court. A law of 1796 [62] required the books of the turnpike company chartered by it to be open at all times to inspection and examination by a committee appointed by the general court. The books were likewise to be open to the inspection of the governor at any time. A true account of incomes and dividends arising from tolls together with a statement of necessary disbursements was to be made annually to the governor and council. Practically the same provisions were incorporated in the general turnpike act of 1804 [63] and in addition a statement of the cost of the road was required. Connecticut was even more specific, for, in 1805,[64] a law was passed entitled "An act to establish a uniform mode of stating and preserving accounts of turnpike companies." Commissioners were to be appointed to inspect the companies and to give the accounts to the state treasurer in such form as he prescribed and on the uniform blanks which he was to have printed. The amount of capital stock was to be stated in one account, while the statement of repairs, expenses, and tolls was to be in another.

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[57] Acts and Laws of Connecticut, 1797, p. 473.

[58] Laws of North Carolina, 1811, Chap. 48.

[59] Rhode Island Public Laws, 1812, p. 155.

[60] Ohio Laws, 1812, Chap. 22.

Other states were no less reticent in requiring similar provisions. New York in her general turnpike law, 1807,[65] required the corporation to file an accurate map of the road with the clerk of the county through which the road passed. Maryland, in incorporating a road in 1801,[66] required an annual statement of receipts and expenditures. For each neglect to make the return the company was to forfeit one thousand dollars. Pennsylvania chartered a canal company in 1791 [67] which, at the end of every third year, was to lay before the general assembly an abstract of accounts showing capital expenditure, income and profits. The canal company chartered in 1798 [68] was to give an abstract of accounts at the end of every six years for the five preceding years. Vermont chartered a bridge company in 1799.[69] At the end of twenty years the judges of the supreme court were to examine into the accounts of the company through an entirely disinterested person whom they were to appoint. He was to be sworn to the faithful discharge of his trust, to be empowered to call before him and examine under oath any person he desired, and was to make out what he considered a fair statement of the cost of erecting the bridge as well as the proceeds arising from tolls. Another company chartered the same year [70] was ordered to lay all accounts before the legislature at the end of every fifteen years. A bridge company formed in 1808 [71] was to be examined by the court representatives at the end of eight years and at the end of every five years thereafter.

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[61] Laws and Resolves of Massachusetts, 1780, Chap. 7.

[62] *Ibid.*, 1796, Chap. 125.

[63] *Ibid.*, 1804, Chap. 125.

[64] Acts and Laws of Connecticut, 1805, p. 691.

[65] New York Statutes, 1807, Chap. 38.

[66] Laws of Maryland, 1801, Chap. 23.

[67] Laws of Pennsylvania, 1791, Chap. 1577.

[68] *Ibid.*, 1798, Chap. 1963.

[69] Laws of Vermont, 1799, p. 59.

Some years later other states enacted laws of a similar nature. North Carolina [72] chartered a canal company in 1811 and at the end of twenty-five years she required a sworn statement of tolls for the preceding years. Another company chartered the same year [73] was to make a sworn annual statement to the superior court of all receipts and expenditures. Delaware required a road company chartered in 1815 [74] to give an abstract of accounts every third year for ten years; after that an abstract at the end of every ten years for the preceding three years. Virginia required the turnpike company incorporated in 1817 [75] to make a report at the end of the first year of the amount of stock expended, expenses, and toll received, while a similar report was required at the end of every three years. The board of public works, to which the report was to be made, was to prescribe the form of the report and determine how it was to be verified. Ohio required the turnpike company chartered in 1817 [76] to keep account of expenses and receipts. Books must be always open to the inspection of the county commissioners or an agent appointed by the legislature. A refusal to exhibit books forfeited all rights conferred by the act. An act in 1819 [77] required a bridge company to keep and file expenses with the county commissioners. When New Jersey incorporated a canal company in 1820 [78] she demanded at the end of twenty years and at the end of every ten years thereafter an account of profits and expenditures to be given to the legislature. Books, papers, and transactions after twenty-one years were at all times to be open to the inspection of the state treasurer or any one appointed by the legislature.

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[70] Laws of Vermont, 1799, p. 38.

[71] *Ibid.*, 1808, Chap. 63.

[72] Laws of North Carolina, 1811, Chap. 25.

[73] *Ibid.*, 1811, Chap. 48.

[74] Laws of Delaware, 1815, Chap. 45.

[75] Laws of Virginia, 1817, Chap. 38.

[76] Ohio Laws, 1817, Chap. 13.

[77] *Ibid.*, 1819, Chap. 67.

[78] Laws of New Jersey, 1820, p. 55.

From this review of the legislation by which public utility companies were formed before 1820 it can be seen that regulation existed at even this early date. In fact, regulation and the public utilities have grown up hand in hand. At first the regulation was simple, but the operations of the companies were simple also. As the companies became more extensive, regulation, even in these early years, branched out into new fields, and was of such character that it naturally conforms to a classification of present-day methods. Only in the agency of the regulation and in the method of remuneration has there been marked change. Instead of a special commission to look after each corporation, a state commission now supervises all the public utility companies in a state. Remuneration of commissioners, instead of coming directly from the corporation, is now paid from public funds. This is generally more than equalled, however, through greater taxation, so in the end the results are the same. Regulation, then, cannot properly be called a modern method of handling the public service corporation, for it is simply the extension of a system which began with this class of corporation and the application of it to meet the different phases of the problems arising out of the peculiar relationship of public utilities to the state.

75. Growth of State Commissions *

The need of some fair and effective method of utility control which, as has been stated, produced the present Public Service Commissions, did not produce them at once. The want of this sort of regulation was felt only a little in the beginning, but grew more pronounced as time went on. The steam railroads were the first of the utilities to come under the Commissions. For a long time after this took place, the states did not bother themselves with the other utilities, leaving them to the local authorities. The present so-called Public Service or Utility Commissions were, for the most part, the outgrowth of these old Railroad Commissions. These Commissions, weak in the beginning, were gradually strengthened, and their jurisdiction extended over all of the other important public utilities. In some instances, the old Com-

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* Excerpt from H. C. Spurr, *Guiding Principles of Public Service Regulation* (Rochester: Public Utility Reports, Inc., 1924), I, i, 9-15.

missions were retained, their power merely being enlarged; in others, new Commissions were created.

The first of the Railroad Commissions appeared in New England. New Hampshire and Rhode Island each set up a Commission in 1844, Connecticut in 1853, and Vermont in 1855. New York established a Commission during the same year. Maine followed in 1858, Ohio in 1867 and Massachusetts in 1869. All of these Commissions were what have been termed "weak Commissions." Their main business was to gather information. They had nothing to do with financial problems, or the protection of the corporation and the public from ruinous competition; nor were they concerned with discrimination, rates, or even with adequacy of service.

The first Commission of New York state was a fair type. . . . In the seventies, a number of the states became greatly interested in the question of transportation rates, due to the activity of the Granger organizations which at that time had a very large membership and took a firm stand for state and national control of transportation companies. One of their principles was: "That all corporations are subject to legislative control; that those created by Congress should be restricted and controlled by Congress, and that those under state laws should be subject to the control, respectively, of the states created; and that such legislative control should be an express abrogation of the theory of the inalienable nature of chartered rights, and that it should be at all times so used as to prevent moneyed corporations from becoming engines of oppression."

As a result of this agitation, a number of the states began to pass Granger laws fixing the maximum rates of transportation of freight and passengers. During the next twenty years, a large number of new Railroad Commissions were established. The passage of maximum rate laws was the marked movement of the period from 1870 to 1890.

During the period from 1890 to 1902, there was a tendency to relinquish control over rates by direct action of the legislature for more elastic regulation by Commissions. The authority of the Commissions over technical matters, such as construction, maintenance, and operation, was also extended. The Commissions were given not only the power to keep themselves informed about these matters, but to require the railroads to comply with their orders in respect thereto.

During this period, the physical valuation of railroad property as a basis of rate making also arose. A decision of the Supreme

Court of the United States[1] established the rule that the basis of all calculations as to the reasonableness of rates must be the fair value of the property used for the convenience of the public. Texas was the first state to employ experts to make a physical valuation of its railroads. Following the decision of the Supreme Court in the case mentioned new Commission Statutes usually empowered the Commissions to value the property of common carriers as a basis for rate making.

In 1905, new Commission laws were passed in Washington, Wisconsin, and Indiana. These laws were much alike. The Wisconsin law attracted considerable attention, and was spoken of very highly by students of economics. By this law the Commission was given jurisdiction over steam railroads, electric roads outside of incorporated towns and villages, over street-car companies, express companies, and private car lines. It could fix rates on its own motion or on complaint; had jurisdiction over service; could make joint rates. The law also contained the usual provisions against discriminations, and provided for inspection and examination of the books and records of the companies. The law also fixed penalties in order to enforce obedience to Commission orders, and the Commission was authorized to proceed in equity by injunction to compel railroads to perform the conditions of Commission orders.

In the Indiana law, jurisdiction was extended to pipe-line companies as common carriers. The Washington law contained a provision against the issuance of passes.

Up to this time, the jurisdiction of the various Commissions was limited to railroads and corporations which might fall under the definition of common carriers. During this period, the state policy towards utilities which could not be classified as common carriers, was to leave the matter of regulation in the hands of local boards or officers, such as city, town, or village councils or boards, or boards of supervisors. In Connecticut, gas and electric plants were in control of local boards of gas and electric commissioners.[2] In 1885, Massachusetts established a Board of Gas and Electric Light Commissioners. This Board after a long and honorable career was abolished in 1919 by its consolidation with another Commission known as the Public Service Commission, the single Commission being designated as the Department of Public Utilities.

In 1905, a Commission of Gas and Electricity was also established in New York, but this was superseded by the Public

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[1] *Smyth* v. *Ames*, 169 U. S. 466 (1898).

[2] Laws in 1893.

Service Commissions of the First and Second Districts established by the Statutes of 1907. The latter Commissions were both abolished in 1921 and a new State Public Service Commission and a Transit Commission for New York City created.

An examination of utility laws in existence a few years prior to 1907 shows that most of the powers of the present Commissions existed, to some degree, at least, in the earlier statutes. . . .

The modern period of state regulation may be said to have begun in 1907. In that year, Wisconsin extended the jurisdiction of its Commission to telephone, telegraph, light, water and power companies, and New York established two Public Service Commissions, giving them jurisdiction over railroads, street-railroads, common carriers, gas and electric companies—other corporations including telegraph, telephone, baggage, and transfer companies being brought in afterwards. In the same year, Georgia enlarged the jurisdiction of its Railroad Commission so as to include telephone and telegraph corporations, street-railways, gas and electric companies. The lead of these states was soon followed and in consequence modern Commissions with very extensive powers have been created in most of the states. Many of these commissions are very active, all of them together deciding 10,000 cases or more a year, including the disposition of the formal matters before them. Many of their decisions are of great importance, discussing problems relating to accounting, capitalization, corporation management, economics, monopoly and competition, standards of service, valuation of utility property and return on investment. Many of these cases have involved property interests of great value. Others, of course, are of little or no general importance because dealing with minor matters, with administrative details or mere questions of fact, of interest to no one outside of the immediate parties involved. The law which has sprung up as a result of these Commission activities, the opinions of the Commissioners themselves, and their review by the courts, might almost be said to constitute a new branch of law and economics of very great importance, as yet imperfectly understood by the public and even by lawyers or by utility men who are vitally concerned. The change of policy manifested by the enactment of these modern public utility Commission statutes is in the direction of concentrating the control over various classes of public utilities in the hands of a single state Commission. The most marked change has been in the extension of jurisdiction of the Commissions to classes of utilities before exempt.

76. State Regulation of the Electric Power Industry *

Charters. The business of generating and distributing electric energy is performed almost entirely by corporations operating under charters which may or may not be issued by the state, or states, in which they operate. In the case of domestic corporations each State may exercise considerable control over the terms of charters and, through them, over the activities of corporations of its own creation. This power has been supplemented in the state of Illinois since 1913 by a provision in its public utility law to the effect that no franchise, license, permit, or right to own, operate, or control any public utility shall be granted or transferred to any grantee or transferee other than a corporation duly incorporated under the laws of the state.[1] In the case of states in which the operation of public utilities by foreign corporations is allowed, the state's control is limited to such requirements as are imposed in the granting of permits to engage in business in the State.

In most states the granting of charters is done in accordance with a general state enactment applying to all kinds of businesses. Frequently, also, the provisions of the state law are administered by a state corporation commission, or other organization quite separate and distinct from the agency charged with the regulation of public utilities. Consequently, state public utility commissions generally have very little to do directly with the chartering of the companies they regulate. In fact, in some states the utility commission does not begin to function respecting electric power companies until they actually begin the production, transmission, or distribution of energy.

Franchises. The generation and distribution of electric energy involves the use of public roads and streets, the granting of the right of eminent domain for the building of transmission lines, and the entry upon and establishment of service connections on private property. These matters are, and always have been, primarily of local concern. In addition, the investment of capital in a plant to serve a locality over lines located in public streets and highways requires the assurance that the investment, at least for a stipulated period of years, will not be rendered useless, or confiscated, by subsequent denial of the privilege of using such public property.

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* Excerpt from Federal Trade Commission Report (Senate Document No. 46), *Supply of Electrical Equipment and Competitive Conditions* (Washington: United States Government Printing Office, 1928), Chap. XII, pp. 182-185; 187; 189-190.

[1] Illinois public utility law, 1913, secs. 28, 29.

Out of the ancient idea of the franchise as a gift of royal authority there was developed, apparently, the more modern idea of the franchise as a grant by local governing authority permitting the use of public property upon stipulated conditions. In its more modern form the franchise is in the form essentially of a contract, and has been so interpreted by the courts. With the recognition of the electric public utility as a local monopoly respecting which rate regulation is desirable, and in the absence of state agencies to perform the regulatory functions, rates were fixed in early attempts to regulate by the terms of the local franchise contract. Such local rate fixing was found to be economically unsound, and with the development of state commissions, has become a part of their function. Without the state public utility commission the franchise remains as binding as any other common law contract. With the establishment of utility commissions, the tendency is to make the franchise contract binding only with respect to matters which, under the construction of public utility laws, are not within the province of the state public utility commissions to investigate and determine. Thus the local franchise, although lessened in its scope in recent years, is still an important document for the protection of interests of both the utility and the public it serves with respect to matters of local import that are not usually included within the province of commissions by the laws creating them.

Certificates of Public Convenience and Necessity. An essential feature of the regulation of the electric power industry is the recognition of the fact that local monopoly yields the economic advantages of large-scale production and the elimination of duplicated generating capacity, distribution systems, and operating personnel that are unattainable when two or more companies compete in the same territory. Therefore, a well-established feature of efficient state regulation is the protection by law of operating companies in the enjoyment of local monopoly. The utility laws of about half of the states require power companies to obtain certificates of public convenience and necessity before they are allowed to begin the generation or distribution of electricity.

One of the first points to be decided in the issuing of certificates is whether the service offered is sufficiently charged with public interest to be classed as a public utility. In general, private plants serving a single consumer, such as a hotel, or an apart-ment house and its tenants, or a manufacturing business, would not be so classed, and would not be required to obtain a certificate of convenience and necessity. If, however, the use concerns a whole community, as distinguished from a single individual, or a limited group of individuals, providing the service for themselves, a certificate of convenience and necessity becomes necessary. Such permits are issued by the state regulatory agency if, after a determination of the facts, it is found that the public convenience will be served by the establishment and operation of the proposed plant. The facts pertinent to the issuance of certificates include: (a) whether the business to be done is so clothed with public interest as to be classed as a utility subject to regulation; (b) whether the business is one over which the State, as distinguished from the Federal Government, properly has jurisdiction; and (c) whether the public interest will best be served by the issuance of the certificate to one rather than to another company either in cases where competition exists within an already occupied area or in cases where the assignment of unoccupied territory is involved.

It is evident that in the issuance of certificates of convenience and necessity the state, through its duly constituted commission is assuming certain functions previously exercised by cities and other political subdivisions in the granting of franchises and permits. From this fact controversies may arise, due either to the feeling on the part of local governmental agencies that their functions are being usurped, or that omission by the state agency to consider some matters of local importance leaves the local public interests inadequately safeguarded. This, however, may be avoided by the insertion in the certificate issued by the state of provisions requiring the company to obtain from the local government further authorization in the form of permits or franchises in which local public interests may be protected. Thus coördinated, the certificate of public convenience and necessity and local permits become important instruments in public-utility regulation.

Although not so frequent in the electric-power industry as in some other public utilities, there sometimes occur, as just noted, cases in which a utility commission is called upon to discriminate, in the public interest, between the relative abilities of two or more applicants to render the most efficient service, or to consider the grant of a certificate to a company desiring to enter territory already occupied by another company. In either case the presumption is that, under the generally adopted principle that monopoly in the generation and distribution of power is preferable to competition, only one permit will be issued for the same power distribution area.

From time to time, cases arise in which the state commissions are called upon to decide between a company already occupying a territory, but giving poor service, and a new applicant. In the absence of full authority to regulate service, the issuance of a permit or certificate in such cases may be justified, especially where there is a well-developed and well-founded local demand for better service, that cannot, under existing state law and regulation, be satisfied in any other way than by authorizing a competing company to enter the territory. Such cases apparently point to the need of greater power on the part of the commissions to regulate services.

More directly within the scope of effective regulation, through the granting of certificates, is the possibility of preventing monopolization of territory for future development by the insertion in certificates or permits of time limits within which construction must be completed. The state commission of Maryland has recently begun the insertion of such clauses for the reason stated.[2]

The question as to whether the issuance of certificates of convenience and necessity by the state marks a great curtailment of home rule depends largely upon the consideration that is given to local public opinion and the degree to which provisions are inserted in state certificates requiring further authorization from local authorities respecting matters of local importance. With proper coördination between the two, the results attained would seem to warrant more general adoption of state laws making the issuance of permits or certificates by state regulatory bodies a part of their regulatory duties. . . .

Mergers. A feature of the electric power industry has been the economic advantages to be gained, both through speculation and in the way of greater operating economy, by consolidating local plants to form larger and larger operating systems. In recent years, with the growth of holding company structures, the same movement is being carried out by the further consolidation of more or less widely separated local consolidations under a single financial or management control.

State control of the issuance of securities was developed as the means of curbing speculative manipulations in the formation of early consolidations of local operating companies. In states

[2] See *Electrical World,* XC (Sept. 17, 1927), 583.

where such control began sufficiently early to restrict the total of securities outstanding to the reasonable investment for rate-making purposes, the two objects of security regulation have been quite effectively accomplished with respect to local combinations. . . .

Relation of Services to Rates. The fact that there is a reciprocal relationship between rates and quality of service makes regulation of services of equal importance with regulation of rates. A measure of the reasonableness of a rate is the quality of the service. If the rate is too high with respect to the service rendered, the public interest is improperly safeguarded, while if the service rendered is too expensive for the rate, the capital invested will be impaired, and again the public will, in the long run, be the loser through lessened ability of the utility to render service, or, if pressed to too great an extent, bankruptcy of the utility company.

Because of these reciprocal relationships, the regulation of services as to quality becomes as important a function of state public utility commissions as regulation of rates. This was recognized in 1917 by a committee of the National Association of Railway and Public Utility Commissioners. The report of this committee recommended among other things: (1) that the regulation of the service of public utilities be vested (as is done by many of the states) in the public utility commissions of the various states; (2) that each state commission establish standards of service for each class of utilities under its jurisdiction; (3) that each state establish and maintain the quality of the service furnished; and (4) that each commission recognize the importance of adequate service to the public, and that it take such steps as may be necessary to insure the furnishing of adequate and efficient service by public utilities.[3]

Among the more important phases of state regulation involved under the outline above are control of rates and quality of service, of extensions, and of improvements and renewals of property to secure the betterment of service or more economical operation. The power of the state to require operating power companies to do these things is now well established in some, but not in all, respects.

Regulation of quality of service involves the establishment and enforcement of standards of service including within their scope the quality of service, and the like, as will reasonably safeguard the public against personal injuries and property damage. The power of the state to supervise with respect to these things appears to be well established.

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[3] *Proceedings National Association of Railway and Public Utility Commissioners*, Report of Committee on Service of Public Utility Companies, 1917, pp. 520-521.

The power of the state to require extensions of service appears to be less well established. There seems to be little doubt that state legislatures, and their commissions, have the right to require such extensions as are reasonably required to render service within areas covered by franchises and permits. For areas not so covered, the power appears to be less well defined, and concrete attempts to exercise such control appear to be less general.

On the third phase of regulation, that of power to require important renewals of plant and equipment and the introduction of more economical methods of operation for the purpose of improving service or of lessening costs, the power of the state to act is even less well established. It would, however, seem that as a matter of public policy in a regulated industry in which the force of competition as an incentive to keeping plants, methods of operation, and services at the highest possible standards of excellence, is absent, the authority of the state to act in the public interest should be unquestioned. The power to order improvements in physical facilities that will provide greater convenience or safety to the public is quite well recognized. As to requiring installation of improved generating equipment as a means of reducing costs with possible reduction in rates where sufficient units of a poorer type already exist, the power of the state commission is not so clear. Under fully regulated monopoly where the normal incentives of competition are absent the public interest would seem to demand that the state commissions exercise functions of the latter type. It would, therefore, appear that many state legislatures may well consider the advisability of remedying, by further enactment, present deficiencies in the powers of their commissions to regulate service.

77. Control Over Security Issues *

There are two leading views as to the proper method of regulating public utility security issues. One is that there should be absolute governmental control and the other that there should be modified governmental control. Absolute control means issuance

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* Excerpt from H. C. Spurr, *Guiding Principles of Public Service Regulation* (Rochester: Public Utility Reports, Inc., 1924), I, iv, 50-53.

only upon authorization of a Commission, based upon a statement of the amount and character of the issue desired, and its purpose together with a full report on the assets and liabilities of the company. Under this policy the Commission sets a time for a hearing, investigates the application, and, if the issue is authorized, fixes the amount of the issue and the price at which the securities are to be sold, specifies the purpose for which and the conditions under which they are to be issued and makes any other requirement within its power which it may deem essential.

Modified governmental control is merely a publicity policy. The utility is required to furnish the Commission a detailed statement of the amount of the issue and the purposes for which the proceeds are to be used. This must be followed later by an accounting and a full and accurate statement to the stockholders.

Both of these methods are in operation. In Pennsylvania, for example, public utilities may issue securities upon filing with the Commission what is known as a certificate of notification, the law requiring certain facts to be stated under the verification of the treasurer, auditor, controller, or other acting fiscal head of the company. These certificates are deemed to be public records open to inspection, and may be given such further publicity as the Commission may consider to be for the public interest or welfare.[1] The most important facts are the nature and purpose of the issue. The Commission publishes from time to time bulletins containing synopses of these certificates of notification. The Commission does not have the power definitely to determine whether capital issues shall be made, but the Commission has to be completely informed; that is, the public through it has to be completely informed, as to proposed issues, and in every case, great emphasis is laid upon the revenue needs.[2]

Absolute control of security issues by the Commissions is, however, the more favored policy. The common form of statutes providing for Commission supervision of securities is, that a common carrier or public service corporation may issue stocks, bonds, notes, or other evidence of indebtedness payable at periods of more than twelve months after the date thereof, when necessary for the acquisition of property, the construction, completion, extension, or improvement of facilities, or for the improvement or maintenance of its service, or for the discharge or lawful refunding of its obligations: Provided, and not otherwise, there shall have been secured from the Commission an order authorizing such issue and the amount thereof, and stating that in the opinion of the Commission, the use of the capital to be secured by the issue of such stocks, bonds, notes, or other evidence of indebtedness is reasonably required for the said purposes of the corporation.

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[1] *Pennsylvania Public Service Commission Law,* Article III, p. 4.

[2] *Proceedings of the National Association of Railway Commissioners* (1914), p. 341.

The companies are required to go before the Commission and make the showing necessary to entitle them to issue the securities. If the Commission decides to grant the application, the order will specify the nature of the securities; that is to say, whether they are stocks or bonds, or notes, and all facts necessary to identify them, provide the minimum for which they may be sold, and specify the purpose for which the proceeds shall be used. The company will then be required to account for the proceeds. Very often the utilities will not be allowed to dispose of the entire issue at once, but only in installments, as, for example, when money is needed from time to time in the course of new construction. The companies must then by supplemental petitions obtain the consent of the Commission upon a proper showing for the issuance of each additional installment.

Illinois furnishes a typical example of the policy of absolute governmental control. When an application is made for the issue of stocks and bonds of a railroad in that state, the corporation must present a complete statement of the condition of the road. The Commission is advised as to everything the applicants know about the road. That does not mean that the Commission must have a complete appraisal, but an inventory is required. The Commission has to be shown the amount of stocks and bonds that have been issued. If it is a refunding proposition, the Commission requires a full showing of conditions. If the company wishes to get money upon bonds for proposed betterments and improvements, it must make its application in detail, showing specifically just what the proposed improvements and betterments are to consist of and where the improvements are to be made. If, on investigation by the Commission, the bonds are permitted to be issued, and it is determined that they shall be allowed for that purpose, the order further provides that they must carry out what is proposed to be done in the application for the bonds, and that the proceeds of the sale of those bonds must go to doing of that particular thing. Not only that, but the company must, within thirty, sixty, or ninety days, as the conditions and circumstances require, file a report with the Commission stating in detail what they have expended on the proceeds of the stocks and bonds for that particular purpose. The expert accountants and engineers of the Commission go over the reports that are furnished with reference to that. The Commission is advised of everything that is done with any of the moneys that are paid by the authorization of the issue of stocks and bonds in the state. The petition must contain a complete statement of what is wanted, why it is wanted, and the basis upon which it is asked for.[3] . . .

Even Public Service Commissions favoring absolute governmental control of security issues have felt that they should have more discretion than is given them under some of the statutes. In an elaborate report of the Committee on Capitalization and Intercorporate Relations of the National Association of Railway Commissioners, the Committee stated that it believed that the regulatory authority over railroad capitalization should be given a freedom unrestricted by unnecessary or harmful statutory inhibition; that the carriers on their part should be equally unrestricted by rigidly fixed provisions; that the question of capitalization must always be a matter of discretion; that it cannot be circumscribed by hard and fast rule of law and method. The Committee stated that in order that such a maximum of freedom might exist, it was imperative that the statutory provisions as to stocks and bonds be as elastic as is consonant with good public policy. The Committee's suggestion was that interstate carriers should be left free to issue common stock without par value. The Committee also unhesitatingly suggested that public regulatory bodies should proclaim the doctrine of a wider latitude for supplemental financing. Otherwise, instead of bringing a desirable influence to bear upon capitalization, they would inevitably work mischief. The Committee said:

> "A proper balance should be maintained between the fixed obligations and the equities of the stockholders. If requirements are unnecessarily rigid in relation to the issues of stock, the carriers and the public utilities will be driven to the expedient of bond and note issues in a degree that will disturb the equilibrium that sound finance requires. On the other hand, if a ready avenue is created for the entrance of money through stocks into these railroad and public utility enterprises, a system of finance will gradually be evolved which will enable these corporations to weather without difficulty storms and squalls which now leave a wake of wreckage. A stock without par value will be readily acquired by existing groups of stockholders, and experience

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[3] *Proceedings of the National Association of Railway Commissioners* (1914), p. 356.

leads us to believe that in this way the stockholders' rolls will gradually be very greatly enlarged."[4]

Under existing laws, even in states which are proceeding under the policy of strict regulation, the authority of the Commissions over security issues is not entirely discretionary. There are limits beyond which these regulatory bodies cannot go. In Massachusetts, for example, it was held that the Board of Gas and Electric Light Commissioners was without power to refuse an application for an issue of securities on the ground that the company's earnings were sufficient to take care of the capital needed without regard to the issuance of securities.[5] The New York Court of Appeals has declared that the legislation with reference to Commission control of public utility securities was not designed to make the commissioners the financial managers of the corporation, or to empower them to substitute their judgment for that of the board of directors or stockholders of the corporation as to the wisdom of the transaction; but that it was designed to make the commissioners the guardians of the public by enabling them to prevent the issue of stocks and bonds for other than statutory purposes.[6] And the supreme court of Kansas in discussing a security issue provision of the type found in most of the modern public service statutes has said that the Commission is not a general guardian over public utilities or the public, and cannot, by an exercise of discretion over the issuing of bonds and stocks, control the activities of business enterprise. Business initiative and business sagacity are left free to improve what they deem to be opportunities; and a public utility has the right, under the statute, to issue whatever bonds and stocks may be necessary to carry out corporate powers, acquire property, construct and extend facilities, and maintain and improve service. The Commission has no discretion to refuse to certify such securities. On the other hand, proposed securities must be necessary for some purpose designated in the statute, and the Commission has full power to ascertain the truth of the statement, indispensable to an application for a certificate, that the capital stock to be secured is necessary and required for such purpose and will be used therefor.[7] And the Nebraska Commission, although convinced that public convenience and necessity did not require the construction of a certain new telephone system, held that the Commission could not deny an application for an issuance of securities for such construction, since its statutory powers extended only to the determination of the question whether the issue of securities were reasonably required for the purposes of the corporation; and that the Commission could not read into the statutes the words "when necessary or reasonably required for the public good and welfare."[8]

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[4] *Proceedings of National Association of Railway Commissioners* (1916), pp. 215, 245.

[5] *Fall River Gas Co.* v. *Board of Gas & Electric Light Commissioners*, 214 Mass. 529, 29 Ann. Rep. Mass. G. & E. L. C. 386a (1913).

[6] *People ex rel. Delaware & H. Co.* v. *Stevens*, 197 N.Y. 1, 90 N.E. 60.

[7] *Kansas City K. V. & W. R. R. Co.* v. *Bristow*, 101 Kans. 557, P.U.R. 1918A, 732, 167 Pac. 1138.

The Indiana Commission assumes it to be fundamental that the legislature could not, and has not attempted, to grant to the Commission legislative powers over security issues; and further, that the arbitrary determination of the question whether stocks and bonds may or may not be issued was the exercise of legislative power, and that any law which attempted to place in the hands of the Commission such arbitrary authority would be unconstitutional. The law creating the Commission stipulated when, and for what purposes, a public utility corporation might issue stocks or bonds, setting out in detail the necessary conditions that must exist before such stocks or bonds might be issued, and then cast upon the Commission the burden and duty of conducting an investigation and determining the fact or facts in each case, and then provided that if the facts which the legislature specified must exist, do exist, the authority should be granted.[9] And it has also been held in Minnesota that, although the legislature may authorize a Commission to supervise the issuance of such stock as may be authorized by legislative acts, it may not commit the whole subject of the increase of capital stock by corporations to the judgment and discretion of a Commission.[10]

78. The Indeterminate Permit *

The indeterminate permit, as a substitute for the usual franchise limiting the operation of a utility to a definite term of years, entered into the field of practical politics when Wisconsin in 1907 established this system as the law of the state. Since that time, it has been adopted by a considerable number of states in some form or other. The state of Indiana accepted it

[8] *Re People's Telephone Co.* (Neb.) P.U.R. 1915D, 160.

[9] *Re Farmers & Merchants Coöperative Telephone Co.*, P.U.R. 1915B, 55.

[10] *State* v. *Great Northern R. Co.*, 100 Minn. 445, 111 N.W. 289.

* Excerpt from Harry Barth, "The Indeterminate Permit for Utilities Serving Municipalities," *National Municipal Review*, XIV (1925), 738-745.

for all utilities in 1913. Ohio passed an act providing for indeterminate permits for street-railway companies in 1913. California accepted the idea in what is known there as the resettlement franchise act of 1917. This applied only to street-railways. Arkansas accepted the principle for all public utilities by Act 571 of the general assembly of 1919. This was repealed, however, at the next session of the legislature. The state of Louisiana by Act 94 of the extra session of 1921 adopted an indeterminate permit law for cities having a population in excess of 100,000. Minnesota in 1915 accepted the principle for telephone companies only. In 1921 the system was extended to street-railways. The indeterminate permit principle has also been accepted in isolated cases throughout the country. It has often happened that a city has provided for the indeterminate permit in the absence of state legislation on the subject. An example of a city which provides for the indeterminate permit is Kansas City, Mo. In the charter, recently adopted, provision was made for this system.

The public utility companies have been thoroughly converted to the system, and in many states they are distributing educational matter on the subject quite widely. The American Electrical Association received a report on the subject from a special committee delegated to study the matter at its convention in Atlantic City, N. J., October 1924. The report was distinctly favorable, and the Association formally approved the idea. The Investment Bankers' Association of America has also approved of the plan in principle. The National Association of Railway Utility Commissioners, at its convention in Detroit in 1922, formally endorsed the indeterminate permit.

Due in large part to the effort of public utility concerns, determined efforts were made at the last session of the state legislatures to secure an extension of the system. Under pressure from the utilities, which frankly sponsored the idea, the state of Oklahoma accepted the indeterminate permit. Much printed matter was distributed, and a definite campaign of education in the press was also undertaken. The law went into effect on June 26, 1925. In Illinois, likewise, pressure has been brought to secure its passage. In Kansas the indeterminate permit is being widely advocated. These examples are merely illustrative of a general movement to adopt the indeterminate permit principle.

There is nothing obscure about the indeterminate permit idea. It simply adopts the view that a utility should be given the right to operate, as long as it gives adequate service at a reasonable rate. The utility is told to establish services without fear of having its right to use the streets and alleys denied it at some future interval. It is told, on the other hand, that in case it does not give reasonable services it will have its right to serve the city cut off at any time.

Many benefits are prophesied for the utility from the indeterminate permit. In the first place, it is stated that amortization need not be extended over the length of the franchise, which is necessarily for an arbitrary number of years and bears no relation to the actual life of the property. If, for example, a utility secures a franchise for twenty-five years, prudent policy should dictate that the value of the property must be taken out of the earnings before the expiration of the twenty-five years. Otherwise, the utility may find itself with a distributing system on its hands but without power to sell its services, through the expiration of the franchise. This contingency would of course seldom arise. The usual experience, when a franchise expires, is for considerable bickering to take place, followed by the renewal of the franchise. The danger, however, always exists that the franchise may not be renewed, and it is wisdom therefore to guarantee the investment against loss by securing from current income enough additional income to cover the money invested. Where the property depreciates 100 per cent during the life of the franchise, rates need not be abnormally high to provide for the recoupment of the investor in case the franchise is not renewed. But this will not always be the case; in fact, it will seldom be the case.

In the second place, it is stated that the utility is benefited by the fact that it does not have to enter into politics. Where a franchise is subjected to periodic elections to determine whether it may be renewed, the utility operating under the franchise must necessarily engage in local politics. It must establish connections with local bosses. It must engage in petty deals with ward politicians. It must subject itself to constant harassing.

In the third place, it is stated that the indeterminate permit has the additional advantage of making possible lower interest rates for utility loans. Utility companies have not proved that the indeterminate permit, where it exists, actually produces a lower interest rate. They have shown no figures. However, from the viewpoint of theory, it should have that effect. Where no danger is run of failure to secure a franchise renewal, an investor will probably be willing to take a lower price for his money than where such danger is encountered.

These, then, are the chief advantages claimed for the indeterminate permit from the viewpoint of a properly managed utility. Where a utility is dishonestly operated, the advantages are even greater. A utility may under certain conditions by means of the indeterminate permit escape regulation altogether. If the revoking process is difficult, it need no longer fear the wrath of the consumers in case of inadequate service. It runs no great risk of being deprived of its franchise.

There are, of course, dangers inherent in the system from the viewpoint of the consumer. What will happen if the regulating body does not function properly or if revocation is difficult? The utility will then be in the position of having a permit to run indefinitely. It may fix rates at any point it pleases, and be grossly lax in regard to services.

On the other hand, to the consumers, the indeterminate permit has certain advantages. With amortization adjusted to accord with depreciation, a substantial saving in rates may result. Lowered interest charges, theoretically at least, should also lower rates. With operating expenses cut, through the savings in expenditures for political influence, rates may also be lowered. All this assumes, of course, that there will be savings, and that the savings will actually accrue to the consumer rather than the investor. Whether such will be the result depends, of course, upon the honesty of the management and upon the effectiveness of the regulation to which the utility is subjected.

Be this as it may, however, the system of indeterminate permits contains possibilities of savings for operator, investor, and consumer. It probably is an institution, which, sooner or later, will become a fixture in public utility management. Where a real system of indeterminate permits is adopted with proper safeguards, there will be little grounds for objection.

What complicates the situation is that the indeterminate permit is seldom adopted alone. The issue is not clean-cut. What usually happens is that a bill is introduced uniting the indeterminate permit with the certificate of public necessity and the delegation of regulatory authority to a central controlling organization. This naturally confuses the problem. Is the elimination of competition unquestionably a good thing? The adoption of a scheme of public necessity certificates makes this assumption. There is reason for questioning the institution in the electricity field, for example. There is some question as to whether it is wise to prevent competing companies from stringing electric wires on poles and jointly serving the citizens. This is especially true where there are several groups of companies, each controlling water rights and each in a position to give service. There will be duplication of equipment, but after all this is not a very large item in an electric distributing system. A lower rate, resulting from the competition, may more than justify the duplication. This does not mean that the elimination of competition is necessarily bad. The only point, which is being made here, is that a law which combines both the indeterminate permit and the certificate of public necessity may be opposed, not because of the indeterminate principle, but because of the certificate of convenience.

Where the indeterminate permit is combined with state regulation of a utility, what happens is that an old fight appears in a new form. In the case of Wisconsin, Indiana, and Arkansas, the indeterminate permit is granted by the corporation commission, and the same organization is given power to revoke it. In the state of Oklahoma, the indeterminate permit is to be revoked, not by the city in which the permit has been granted, but by the state legislature. As a result, not the indeterminate permit principle, but state as opposed to municipal regulation becomes the storm center. This was especially true in Oklahoma. There was little objection voiced against the indeterminate permit idea. What was objected to was placing in the hands of the legislature the power to determine for four hundred cities when the utilities serving them were acting contrary to the general welfare and should as a result have their permits revoked. It seemed to most city officials that the indeterminate permit idea was being used to camouflage an attempt to eliminate all regulation. It was felt that the question of control and the public utility problems were being thrown into the legislative pool, in which they would forever be submerged. It seemed that a legislative dog-fight was to be depended upon for utility control. . . .

The indeterminate permit should be surrounded by adequate safeguards. Where municipal control is operating satisfactorily, it may well be adopted, but it should specifically provide for revocation by the city. In addition, the conditions under which it may be revoked should be thoroughly set down. Otherwise, thanks to the Fourteenth Amendment of the Federal Constitution, it will unquestionably be the cause of litigation. Judicial squirmishness, where property rights are involved, is so intense that no danger should be run of discovering in the end that the utility has received not a revocable permit but a perpetual franchise. It should probably be laid down in the permit that the utility may be ejected from the city within a stipulated period, if the citizens at a general election have so determined. It should be provided that the citizens shall be the sole judge as to whether service has been adequate and rates fair. In order not to be unfair to the utility, an affirmative vote of 60 per cent of the citizens should be necessary for ejection. Probably, also the concern should be given five years to wind up its affairs.

Where local regulation has failed, and state regulation is looked upon as desirable, the indeterminate permit may be adopted also. It should not be assumed, however, that because municipal regulation has proved unsatisfactory, it should be abandoned. The mere failure of municipal control is not in itself a guarantee of state success. It should not be forgotten that there are grave doubts as to the ability of a public service commission, sitting at the state capitol, however honest it may be, to regulate the rates in a number of growing cities. The administrative problem is almost herculean. The desirability of overloading our central administrative systems is questionable. The ability of men to bear the burden which centralization throws upon them is extremely doubtful.

Should the indeterminate permit be accepted where the state is the regulating body, the authority to revoke the permit should assuredly be vested in the public service commission. The Oklahoma plan of permitting the legislature to be the judge is vicious. The legislature is totally unfit to act in this capacity. It is already overburdened. An individual legislator already has more problems to think about than he can possibly handle. The many intricate questions involved in regulating utilities require expert judgment rather than the opinion of amateurs. In addition, the Oklahoma legislature is limited in its sessions to around seventy days out of every two years. It is difficult to understand how such a body can successfully determine whether utilities in several hundred cities are acting satisfactorily.

Where the public service commission has power to control utilities, it should certainly be given complete power to fix both rates and services. It may seem strange that a public service commission can be created without adequate powers of this character, and yet such is the case. The *sine qua non* of state regulation is a regulatory body of adequate powers.

In addition, the commission should be granted ample appropriations. The intricate task of controlling fifty or sixty utility companies cannot be done with insufficient funds. Yet there are few commissions, at least in the Middle West, which are not hampered through lack of money. This is parsimony rather than economy. Our state regulating commissions are in a position to perform possibly the most valuable service which states render, but they cannot be successful if they are handicapped through lack of finances.

The state of Oklahoma has an institution which is proving valuable. This is a special counsel to represent the cities before the corporation commission, A well qualified attorney now represents the cities before this organization. He is paid out of state funds, and performs a valuable function. The only defect of the scheme is that the agency is not sufficiently well provided for financially. In some months the counsel has the impossible task of preparing a brief a day. He has been in court for two weeks at a stretch. No lawyer should be compelled to work under such difficulties. With increased appropriations for this department and with increased powers for the corporation commission, state regulation in Oklahoma would have a real opportunity to prove its merits. As it is the cities cannot provide counsel equal in training and experience to the counsel of the utilities. Usually the counsel provided performs a labor of love as it is underpaid. It is only seldom that it can devote full time to cases before the commission. A better equipped counsel for cities in the corporation commission would tend to eliminate dissatisfaction.

Another prerequisite of a satisfactory indeterminate permit system would be definite specifications in regard to the revocation of permits. In at least one state, Oklahoma, it is provided that the permit may not be revoked unless no injury is done to the owners of the utility and unless the citizens of the entire state are being harmed by a continuance of the permit. Qualifications such as these may be interpreted by the courts so as to make revocation impossible. At best, vague limitations of this character can lead only to endless litigation and strife with accompanying increase in the work of the courts and decrease in popular regard for the institutions of government. It is difficult to see how the indeterminate permit can be revoked without endless conflict over the clause forbidding impairment of obligations and the due process bugaboo.

One excellent feature of almost all the laws is provision for municipal purchase. This is a blanket safeguard against the worst abuses. If conditions become unbearable, the city as a last resort can buy the utility and operate it. This would involve embarkation upon municipal ownership, which is at best hazardous. Still it is a last bulwark, and should never be omitted from an indeterminate permit law.

79. The Municipality and the Indeterminate Permit *

One of the common criticisms of the present method in Wisconsin of state regulation of utilities is that under the indeterminate permit cities are shorn of their power to control their local utilities. This criticism is grounded upon ignorance of the provisions of the Utilities Law, as well as of the powers which cities could exercise under the old franchise conditions. Quite the contrary of the assumption underlying this criticism is true. The powers of municipalities over local utilities are greater now than they were in the earlier franchise period. The conditions existing in this state prior to the enactment of the Utilities Law are made plain in the record of the case of the City of Madison *v.* the Madison Gas and Electric Co.[1] decided in 1906. Action had been brought by the city at the request of citizens to compel the gas company to supply its products at lower rates. The city made application for authority to examine the company's books to enable it to frame its complaint. The gas company applied to the circuit court for an order restraining the plaintiff from further proceedings. This motion was denied by the circuit court, but on appeal the supreme court reversed the lower court and remanded the *cause* with directions that the case against the gas company be dismissed. The court in substance held, in the opinion, that while the court had power to determine whether a given rate in issue were reasonable, "the power to prescribe what the charge shall be for services rendered in the conduct of a business impressed with a public interest is vested in the legislature, and it must be exercised by it directly or through some appropriate agency."

The above decision was handed down shortly before the Public Utilities Law was enacted. Today, or under the Public Utilities Law, the municipalities not only have greater powers than formerly, but they can have the matter complained of investigated at a much lower cost and at much less trouble to it than was possible prior to the enactment of this law. All that is necessary to do to that end is that the city file a complaint with the Railroad Commission, for upon the receipt of such complaint the

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* Excerpt from address by Halford Erickson, Ohio Electrical Convention, June 24, 1914.

[1] 108 N. W. Rep. 65.

Commission enters on an investigation of the same and assumes the burden of practically all the work that is required to arrive at a fair conclusion therein. To this end it tests the service, appraises the plants, audits the books and records, determines what constitutes reasonable allowance for the cost of the service, not only for the plant as a whole, but for each branch of its business, and upon such allowance computes the rates by which they must be covered. If the orders of the commission are appealed to court, they are also defended by the state without direct cost or trouble to the municipality. In addition to this the Commission, through its uniform accounting systems and periodical reports as well as by direct examination of their books and records, is also closely scrutinizing the earnings and expenses of the utilities from year to year, and when it discovers that any utility is clearly earning more than reasonable returns, it reduces its rates on its own motion. This is actually what has taken place in the city of Madison. For in this city the Commission has made one reduction of the rates on complaint by the city, while it has twice afterwards lowered these rates on its own motion and wholly without the city having any knowledge of the proceedings. These reductions were made possible through the rapid growth of the business and through enforced economies of operation by which the expenses were lowered. If the city desires to go further than this and to acquire and operate the utilities, it can do so today under the Public Utilities Law much more quickly and conveniently and even at less expense than was possible before this law was enacted.

In addition to this the municipalities are now empowered to regulate the service and other conditions in the first instance. These are granted by section 1797m-87 which reads as follows:

> Every municipal council shall have power: (1) To determine by contract, ordinance or otherwise the quality and character of each kind of product or service to be furnished or rendered by any public utility furnishing any product or service within said municipality, and all other terms and conditions not inconsistent with this act, upon which such public utility may be permitted to occupy the streets, highways or other public property within such municipality and such contract, ordinance or other determination of such municipality, shall be in force and prima facie reasonable; (2) To require of any public utility by ordinance or otherwise such additions and extensions to its physical plant within said municipality as shall be reasonable and necessary in the interest of the public, and to designate the location and nature of all such additions and extensions, the time within which they must be constructed, subject to review by the Commission; (3) To provide a

penalty for non-compliance with the provisions of any ordinance or resolution adopted pursuant to the provisions hereof.

Previous to the enactment of the Public Utilities Law, the municipalities would thus seem to have had little or no more power of regulation of their local utilities than that which was limited to the terms of the franchise.

After the enactment of the Public Utilities Law the municipalities possess the following powers:

To regulate the quality of the service, the extensions of the plant and other conditions in the first instance.

To grant or withhold permits for the use of its streets and highways for public utility purposes.

To cause the Railroad Commission to investigate the adequacy of the service and the reasonableness of the rates and other conditions and to require it to establish adequate service and reasonable rates and just conditions in other respects.

To acquire the property and business of the utility at the price fixed by the Commission, which price must be fair and equitable to all concerned; and to operate such utilities in the interest of the public.

To secure from the Commission, whenever conditions are such as to demand it, a certificate showing that public convenience and necessity require a second or competing utility, and to grant a permit to such competing utility authorizing it to use its streets and highways for public utility purposes.

That the powers of the municipalities over their public utilities are greater today than they were before the Public Utilities Law became effective is so clear that further comments thereon are superfluous. While all this is true, it is at the same time a fact that few of them ever attempt to exercise all of these powers. One reason for this probably is that the proper determination of what constitutes adequate service and reasonable rates requires the services of experts and that such services are more costly or require greater expenditures than the municipalities feel justified in making. It is an estimated fact that work of this nature can be carried on at a much lower relative cost by the state or on a larger scale than separately by the several municipalities.

The indeterminate permit feature of the Public Utilities law is also objected to by some because they fear it will tend to promote municipal ownership of public utilities and by others because they fear it will tend to retard such ownership. The former position is largely based on the fact that under the Indeterminate Permit and the Public Utilities Law the methods by which such utilities can be taken over by the municipality have been somewhat simplified. In connection with this it may be said that the taking over of a utility is so important a step that it is not likely to be taken merely because the machinery for doing so has been made less complicated. There is nothing to indicate that the framers of the Indeterminate Permit Law desired to either promote or retard municipal ownership or arbitrarily to deprive utility owners of their property. All they apparently had in mind was to provide a franchise or permit that offered greater protection to both the public and the utilities than was afforded by the existing franchises and to assist in providing an effective system of regulation. To this end it was thought necessary to place in the hands of the municipality the power to deal promptly and effectively with those utilities which might refuse to either meet the service needs of the community or to sell out to some one else. If the community needs utility service and is not to be helpless in the presence of arbitrary or unreasonable utility owners, it must have some power that is akin to the recalling of the grant under which the utility is operating.

Under the Indeterminate Permit or Public Utilities Law in Wisconsin several utilities, mostly water works, have been taken over by the municipalities. This fact, however, probably signifies little more than a continuation of the tendency on the part of municipalities to take over water works, which tendency has been rather marked for a great many years. The question of whether the utilities will be taken over by the municipalities is much more dependent upon the attitude of the public, the municipality's financial condition, the way in which the existing utility is managed or operated, and upon whether there is in existence an effective and prompt system of regulation, than upon the machinery and processes by which the transfers are made. It is obvious that either or all of the reasons given may have important bearings upon whether or not a municipality will embark in the public utility business by taking over the utilities by which it is served and by operating them for the purpose of furnishing the service that is needed. A municipality that is without funds and that cannot lawfully issue additional bonds is, of course, not in a position to meet heavy outlays for any purpose. Utilities that are well managed and that have the good will of their customers are not likely to be taken over, especially since under such circumstances the public might have more to lose than to gain by doing so. Effective regulation, such as is provided by several of our utility laws, tends to reduce the need for public ownership. Under such regulation the service is likely to be better and the cost of operation lower under private than under municipal operation. Such regulation, through strict systems of appraisal and accounting, also throw much light on the real cost of furnishing the service, and the facts thus disclosed are mostly such as to have a deterring effect upon the desire of the municipality to take over the plants. Those, however, who are wedded to the municipal ownership idea and who advocate it as a matter of principle, are not likely to change their views simply because such a venture may not turn out to be a profitable one to the public.

80. Holding Company Regulation *

The holding company is generally exempt from direct public utility regulation. The managers and bankers who demand that it remain so are echoing the cry of those who opposed regulation of operating companies twenty years ago. They forget that, though the possible advantages . . . are undeniable, every one of them carries with it an attendant danger. In the competitive struggle for territory now in progress the old evil of purchasing control at excessive cost is reappearing. The comparative ease of financing is a temptation to inflation of security issues, to the hiding of profits under "no-par" stock, fictitious brokerage charges, and other devices; also to the separation of ownership from control by non-voting preferred stock and by pyramiding of holding company upon holding company. Customer ownership may well dull the sense of public right. The controlled construction company opens the door to inflation of construction costs. If the history of the railroads teaches anything we may be sure that here are the germs of unduly high rates, inadequate service, shackles on expansion, disaster to investors. And we have no assurance, such as competition affords in ordinary business, that a due proportion of the possible great economies will be passed on to the public in the form of better and cheaper service. It is no answer to say that electric current is more abundant and cheaper than it used to be. The investors and the research departments of the electric manufacturing in-

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* Excerpts from Philip P. Wells, "Public Regulation of the Holding Company in Public Utilities," *Proceedings of the Academy of Political Science*, XI (1924-26), 708.

dustry have made it so. Is it as abundant and cheap as it ought to be? And what is more important, will it be enlarged and cheapened in the future as it ought to be? These are the real issues.

The holding company, in some of these developments, also menaces proper responsibility of managers to investors. By piling holding company upon holding company, by financing heavily through bonds and non-voting preferred stock, it may and does happen that the investors who put in nearly all the money have little or no voice in the management. Thus assets of $195,000,000 are controlled by the owners of $14,000,000 (par) in one well-known holding company. The financing of a new power development to cost $52,000,000 is so planned that another holding company will ultimately control the whole enterprise without a cent of permanent investment in it. In this aspect the men behind the holding company are trustees of helpless wards. It is probable that public control must be extended in recognition of that fact. The device of no-par stock, which has lately come into general use, tends powerfully to conceal the obligations of the utilities to their investors and consumers.

It is a fallacy to suppose that the regulation of operating companies as now practiced is a sufficient safeguard. Regardless of what the laws may say, the final regulator is the investor of new money. The electric utility business requires a vast and constant flow of new capital investment. This can be attracted only by a reasonable prospect of a fair return, not to the old investor but to the new one. Inflation of costs, of security issues and of fixed charges, to say nothing of resulting public odium and possible bankruptcy, may make it necessary to give an undue return on the old securities in order to attract the new money. In short, either regulation of operating companies must be fundamentally changed or holding companies must be regulated. Perhaps both remedies are necessary.

That the danger of unduly high rates is not imaginary is indicated by an increase of 180 per cent in the stock market value of the common stock of ten representative large power companies from the low price of 1924 to May, 1925, a period of less than eighteen months, after excluding all stock issued in exchange for additional properties, on conversion of bonds, and the like.[1]

There is another and a potent reason for better public control. The lengthening radius of practicable transmission is transcending state lines. All leaders of the electric industry will admit that this process should be allowed to go on. In fact, it should be encouraged. The holding company is the instrument by which it is going on, perhaps the best attainable instrument. A typical holding company originally incorporated in Maine, later reincorporated in Delaware, controls sixty-eight subsidiary companies operating in six other states. No subsidiary operates either in Maine or Delaware. Through its subsidiaries it has built up an interconnected network of electric transmission lines and distribution systems covering portions of three states. Nearly nine-tenths of its business is interstate transmission. This part will be largely increased in the future.

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[1] *Philadelphia News Bureau,* May 27, 1925.

By segregating this interstate business in a separate subsidiary corporation the men who control this holding company can, at their pleasure, place it beyond the controlling powers of the state legislatures acting separately, and Congress has made no move to control it, even if centralized control at Washington were desirable. It is axiomatic that regulation should be co-extensive with the thing regulated. The immediate need is some legal device whereby state regulation may be enlarged to deal adequately and constructively with this new interstate business. To this end the governors of New York, New Jersey, and Pennsylvania have recently invoked the almost forgotten compact clause of the Federal Constitution † so as to secure by agreement among themselves, to be approved by Congress, complete control over this new interstate power business.

82. Significance of Public Utilities Regulation *

With the passing of the experimental period in the history of commission regulation there has come a clearer recognition of its proper aims and its real usefulness. As the legal method of regulation has become more clear-cut, a realization of its economic purposes and of the economic character of public utility industries has permeated public consciousness to a considerable degree. Adequate commission regulation aims to act as a substitute for competition in these industries whose naturally monopolistic character is now recognized. It attempts to secure, and to a large extent succeeds in securing, the advantages of monopoly without its disadvantages. Regulation, and commission regulation particularly, protect the customer in matters of price, quality, and adequacy of service, together with the elimination of the more undesirable aspects of discrimination.

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† EDITOR'S NOTE: With the ratification of the Constitution, the States reserved to themselves all powers excepting those delegated to the Federal Government. As sovereign states they retained the power to contract except as limited by Article I, Section 10, of the Constitution. This limitation did not prohibit compacts with each other which did not interfere with the exercise of the Federal power; and Article III, Section 2, gives recognition to the judiciable character of controversies between states which appear to give such contracts power at law. When, however, compacts are formed by several States to control propositions which are interstate in nature (*i.e.*, control over New York Harbor or a power-pool which affects only a restricted area of the United States), such compacts must be ratified by Congress.

* Excerpt from article by Herbert B. Dorau, *Public Utility Reports* (Rochester: Public Utility Reports, Inc., 1928), Vol. 1928-B4, pp. 9-12.

In achieving the objectives toward which all regulation has in reality been aimed, the administrative commissions have proved themselves particularly useful and efficient. After less than a quarter of a century of trial this new method of control appears to have become a permanent feature of our governmental system, and in the minds of the most students of regulation to have the necessary elements of a satisfactory system of control. Aside from the negative aspects of the question—*i.e.*, the inadequacies of other types of regulation,—the advantages of the commissions have centered around these factors: first, they are competent by daily contact, knowledge, and continuous supervision to enforce both statutory and franchise provisions; second, they afford a means of informal, inexpensive, and relatively expeditious redress of individual and public grievances; third, they bring trained minds and scientific and technical knowledge to bear on the complex problems of regulation; fourth, they are *relatively* removed from political influence and considerations, and may be made more so by a more coöperative spirit on the part of utilities and by a more honest and serious interest on the part of the electorate; and fifth, commissions afford protection to investors and to corporations by placing the responsibility for decisions in the hands of *a body of men whose action is controlled by a scientific technique and a judicial tradition.*

While the movement for commission regulation may be related historically to the desire to protect the consumer of utility services, an unavoidable corollary of this general purpose has made the commission during recent years the champion of the rights of the utilities as well. There has come, during the last ten years, a recognition of the very real community of interest which exists between the public and its utilities. The protection of the rights of the utility to just treatment and an opportunity to earn a fair return upon the investments in its properties has become recognized as absolutely necessary to the furtherance of the fundamental and long-time interests of the public.

To this end public utility commissions in most states have done yeoman service in the period of rising costs during and following the war. Necessary rate increases were in most jurisdictions opposed by the general public and its legislative representatives. The commissions thereby found themselves in the seemingly paradoxical position of being forced to protect those whom they were first intended to regulate, from the assaults of those whom commissions were originally created to protect. As Professor Ripley says: "They stand between two fires; on the one hand they cannot lawfully adopt so strict and narrow a policy as to throttle enterprise. On the other, they must not be so liberal as merely to rubber stamp promoters' schemes."

The position of certain state commissions has been exceedingly precarious as a result. Their position has not been improved by the short-sighted policy of some utility corporations, who, apparently forgetting the unquestionable desirability to all parties concerned of commission as compared with other forms of regulation, have embarrassed the commissions in what may without exaggeration be termed, their hour of need. Already in an unenviable position with the public, commissions have in too many cases been confronted with an obstructionist and non-coöperative attitude on the part of some utility managements. The result of such short-sightedness may prove disastrous to the utilities themselves, for the partial or complete abolition of the commissions or of their mandatory would mean not an abolition of regulation, but unquestionably a substitution of other forms of public action; particularly an extension of local and direct control. The disadvantages and dangers of such alternative forms of regulation stand out at every point in such sharp contrast to all the advantages of state regulation that nothing should be done to prejudice unnecessarily their standing in the opinion of the public.

The practical effect of regulation is difficult to estimate. Regulation in some jurisdictions undoubtedly amounts to little; potential regulation perhaps being the more effective force. On the other hand, in the more progressive jurisdictions there have been large and beneficial results of regulation. Principal among these may be mentioned the development of a technique and a body of administrative law, reflecting the results of the operation of the quasi-judicial, quasi-legislative functions of modern commissions and adequate to accomplish the protection of the consumer. On the other hand modern commission regulation has resulted in stabilization of the industry financially due to the protection of the rights of the utility and the beneficial results of certain other specialized aspects of regulation. Among these may be mentioned regulation of security issues and the subjection to stringent but unquestionably beneficial supervision of accounts.

Through these two features of regulation and the even more popular policy of protecting a utility from ruinous competition, the commissions have contributed materially to the building of the great public confidence in public utility investments.

With an eye always to the service rendered as well as to the cost thereof, commissions have in their dual rôle been able to bring laggard utilities up to the standards established by the state and discouraged wilful neglect of service. More recently progress has been made in attempting to gauge management and in some measure reward or penalize as the circumstances might demand.

It follows that uneconomic and undesirable policies have been pursued in some instances; to some extent this is to be expected and unavoidable. For the most part, however, these ill-advised measures may be attributed to the newness of this branch of administrative law. On the whole the formulation of sound regulatory policy has made such large strides that the errors made must be viewed as the inescapable price of progress.

Indeed, the optimistic language of Professor Glaeser in his new book, "Outlines of Public Utility Economics,"[1] by no means constitutes an inexcusable exaggeration when he states:

> It is now believed by many that the final goal has been reached in that administrative commissions freed from direct political influences, with their expert personnel and broad investigatory, advisory, and mandatory powers, can combine scientific research and administration in achieving a sound public policy. It is at least in accord with the facts to think of a commission as having become a permanent legislature with a special jurisdiction.

[1] New York: Macmillan Co., 1927, p. 251.

CHAPTER VII

THE COST OF THE SERVICE

83. The Cost of Public Utility Services *

The approaches of the economist, of the accountant, and of the engineer vary widely according to the purposes and points of view of these different groups; therefore, the costs involved in providing the essential services rendered by the public utility industries can be classified and described in a number of ways.

But no problem in public utility economics is more important than this problem of what the service rendered costs, or needs to cost. It is a matter of utmost consequence to the owners of public utility enterprises, to the customers of the industry, and to those regulating authorities who must make the decisions so vitally affecting customers and investors.

The development of the public utility concept, particularly since 1907, has brought with it the recognition of the economy of monopoly organization of these industries. With the appreciation of that fact the problem of control had to be faced and the system of regulation, now rather generally accepted, came about. Under regulated monopoly the determination of fair or necessary expense and cost levels is no longer directly determined by competition. Public authority is substituted for competition and some measure or point of reference must be found as a test of the fairness or necessity of expenses incurred and costs undergone. Competition is assumed to operate to keep prices more or less about the cost of production. In the absence of competition it then appears both natural and logical to use the cost of producing the service as the bench-mark of adequacy and equity. With the increasing acceptance of a properly constituted and interpreted cost-of-service basis for the determination of general rate levels and to some extent particular rates, the importance of the cost of every element needed in rendering the service becomes a matter of concern as does also the behavior of the various types and classes of costs under changing economic conditions and various plant circumstances.

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* Adapted from Herbert B. Dorau, manuscript lecture notes, Northwestern University School of Commerce.

The elements in the cost of public utility services would seem to classify themselves most simply into the cost of the plant and the cost of operating the plant. The nature of the expenses can, however, be set forth more clearly by classifying them according to the nature of the commodity or service secured. Of first importance in many of our utility industries, and having a prior claim on revenue, are the expenses for labor in the form of wages and salaries. The share of government out of the revenue of the industry is paid in the form of taxes, assessments, and a great variety of special levies and fees. The third class of expenses, both large and varied in character, are the payments for materials, supplies, and equipment of all sorts. Some of these things are used up in a very short time, others last longer; some render many years of useful service. Whether the materials be used in a second or last forty years their cost must be paid. In the case of commodities offering a long series of uses this provision for repaying the original cost is commonly made by including in the operating expenses a charge for depreciation or retirement. In addition to the cost of the things used up there is a class of expenditures which come under the title of maintenance. It proves economical and necessary not only to secure return by the customers, of funds advanced for the purchase of things needed in the process of producing the service, but also to collect amounts economically expended for prolonging the useful life of equipment by repairs and minor replacements. The line between maintenance and depreciation is not clear, nor hard and fast. Fundamentally both classes of expenses are the same for they account for the cost of materials, supplies, and equipment.

The capital necessary for the purchase of things of single uses or equipment affording a long series of uses must be advanced by the organization proposing to serve. The customer repays only as he uses. Capital commands a market price and this, public service undertakings must pay if they wish its use. Here a fourth class of costs is met with; namely, the cost of capital in the form of a payment for the advance of funds, commonly called loan interest. From the economic standpoint it is loan interest whether paid as interest or dividends. Some capital invested in very fixed and permanent form of wealth turns over very slowly and thus draws a substantial sum, 4½, 6, or even 7 per cent of the capital amount each year. Other capital invested in goods that are quickly used up (working capital) turns several times a year.

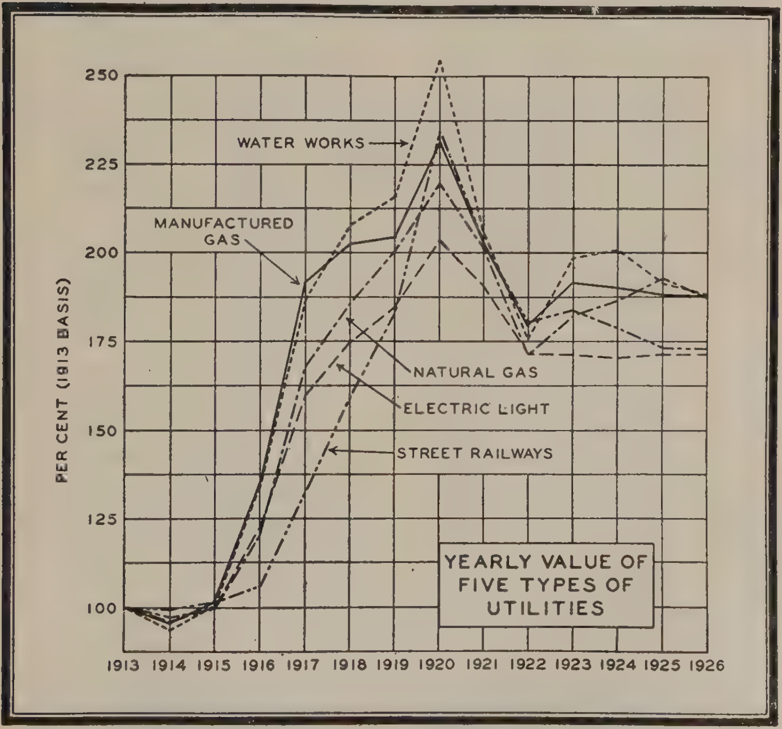
From an accounting standpoint, the cost of the service can be analyzed into operating expenses and fixed charges, plus that part of net income which represents the indispensable and unavoidable return to capital and entrepreneurship, necessary to make and keep the undertaking a going concern.

The costs of providing the service can be classified in further ways. Most interesting as well as involved is the analysis of costs according to their variability with volume of production as set forth under section No. 88 of this chapter where this important question of overhead costs is given special attention.

84. The Changing Cost of the Fixed Investment *

Since public service industries are characterized by very slow turnover of capital invested and great fixity of capital as well, the cost of property and plant is an expense of outstanding

Chart 28



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* C. F. Lambert, "Variations in Physical Values of Public Utilities," *Engineering News-Record*, XCIV (May 7, 1925), 769.

TABLE 17

Waterworks Plant

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Land	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Buildings	11.2	10.8	11.1	13.3	16.5	18.5	20.6	25.6	20.9	19.0	20.8	20.7	20.6	20.7
Equipment	12.1	12.0	14.0	17.3	22.6	23.4	24.3	26.0	23.4	21.8	22.9	23.0	22.9	22.7
Distribution	72.7	67.1	71.3	94.1	143.2	161.1	165.8	197.8	155.8	130.1	149.8	152.2	143.2	140.5
Miscellaneous	1.1	1.1	1.1	1.4	1.8	2.0	2.3	2.8	2.2	2.0	2.2	2.0	2.1	2.0
Total..........	100.0	93.9	100.4	129.0	187.0	207.9	215.9	255.1	205.2	175.8	198.6	200.8	191.7	188.8

TABLE 18

Electric Light Plant

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Land	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Buildings	10.1	9.7	10.0	12.0	14.9	16.7	18.5	23.1	19.9	17.1	18.8	18.6	18.5	18.6
Equipment	38.9	36.7	36.7	47.9	73.5	79.5	81.0	86.7	84.6	75.1	73.4	73.5	73.6	73.0
Distribution	44.8	43.5	47.1	56.1	63.4	69.6	75.2	82.6	77.4	70.4	70.4	69.6	70.9	71.2
Miscellaneous	3.4	3.4	3.4	4.1	5.1	6.0	6.8	8.6	6.8	6.2	6.2	6.1	6.1	6.0
Total..........	100.0	96.1	100.0	122.9	159.7	174.6	184.3	203.8	190.5	171.6	171.6	170.6	171.9	171.6

TABLE 19

STREET-RAILWAY SYSTEM

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Land	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Buildings	4.7	4.5	4.6	5.6	6.9	7.8	8.6	10.8	8.8	8.0	8.8	8.7	8.6	8.6
Track const.......	64.3	63.1	63.4	71.9	83.3	104.8	113.8	144.1	119.9	105.4	113.6	112.8	110.2	110.2
Span const.......	5.8	5.4	6.3	8.7	9.9	9.7	10.0	11.1	9.0	8.5	8.7	8.8	8.1	8.0
Cars and equip....	20.9	22.4	22.8	25.1	27.2	31.1	44.4	61.1	59.1	53.0	47.0	42.9	40.7	40.7
Miscellaneous	1.7	1.6	1.6	2.2	2.9	3.2	3.5	4.3	3.6	3.2	3.3	3.2	3.2	3.2
Total..........	100.0	99.6	101.3	116.1	132.8	159.2	182.9	234.0	203.0	180.7	184.0	179.0	173.4	173.3

TABLE 20

NATURAL GAS PLANTS

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Land	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Buildings	1.6	1.5	1.6	1.9	2.4	2.6	2.9	3.7	3.0	2.7	2.9	2.9	3.0	3.0
Equipment	1.7	1.6	1.8	2.6	4.0	3.6	3.5	4.1	3.1	3.1	3.1	3.1	3.0	3.0
Distribution	92.2	89.9	92.0	111.0	155.7	182.9	186.5	202.4	187.3	158.4	168.7	173.2	175.0	174.6
Miscellaneous	2.9	2.8	2.9	3.3	4.4	5.1	5.8	7.8	6.4	5.6	5.9	5.7	5.5	5.4
Total..........	100.0	97.4	99.9	120.4	168.1	195.8	200.3	219.6	201.4	171.4	182.2	186.5	188.1	187.6

TABLE 21

ARTIFICIAL GAS SYSTEMS

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Land	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Buildings	6.8	6.5	6.7	8.1	10.0	11.2	12.5	15.5	12.7	11.5	12.6	12.5	12.4	12.5
Equipment	30.4	29.1	33.1	49.9	76.4	68.7	67.2	75.9	66.1	62.8	63.4	61.2	60.5	60.6
Distribution	56.5	54.4	55.6	68.0	98.3	114.8	116.5	130.4	115.6	98.2	107.5	108.6	107.3	106.7
Miscellaneous	2.1	2.1	2.1	2.5	3.1	3.6	4.1	5.5	4.6	4.1	4.2	4.0	3.9	3.8
Total..........	100.0	96.3	101.7	132.7	192.0	202.5	204.5	231.5	203.2	180.8	191.9	190.5	188.3	187.8

Water Works: 25 systems; 68 items, of which the main ones are land, buildings, boiler-room equipment, pumps, steam piping, miscellaneous equipment, cast-iron pipe, wrought-steel pipe, wood pipe, valves and hydrants, meters, standpipes, reservoirs, furniture and fixtures, tools, autos and miscellaneous.

Electric Light Plants: 25 plants; 84 items, of which the main ones are land, buildings; boiler room, engine room, and miscellaneous equipment, power transformers, lighting equipment, poles, conductors, distribution transformers, meters, underground conduits, furniture and fixtures, tools, autos and miscellaneous.

Street-Railways: 10 systems; 82 items, of which the main ones are land, buildings (car barns and shops), tangent track, special layouts, grading, paving, bridges, span construction, poles, conductors, cars and equipment, furniture and fixtures, tools, autos and miscellaneous. Power plant buildings and equipment excluded because power is so frequently bought from a separate department or company.

Natural Gas: 11 systems; 58 items, of which the main ones are land, buildings, holders, miscellaneous equipment, cast-iron pipe, wrought-steel pipe, regulators, governors and valves, meters, furniture and fixtures, tools, autos and miscellaneous.

Manufactured Gas: 20 plants; 63 items, including land, buildings, boilers, gas machinery, holders, miscellaneous equipment, cast-iron pipe, wrought-steel pipe, regulators, governors and valves, meters, furniture and fixtures, tools, autos and miscellaneous.

importance. The cost of reproduction of property and plant has become peculiarly important during the recent years of rapid price fluctuation and change. Chart 28 and Tables 17-21 from an excellent study of this problem will give a picture of the changes that have taken place during the period 1913 to 1926 and the effect of the price revolution upon the physical values of various utility plants.

85. Investment in Property and Plant *

Certain approximate relations have . . . been given between the cost of public utility property and operating revenues. This ratio ordinarily lies between 4 to 1 and 5 to 1, with an appreciable number of cases—largely electric light and gas companies—where this ratio is lower, and a substantial number of other properties—especially railways, electric property in large cities with underground and transmission lines, and hydro-electric plants—with higher ratios. Such measures of cost are not wholly dependable because of wide variations in rates and development of business to which the rates apply.

* Excerpt, L. R. Nash, *Economics of Public Utilities* (by permission McGraw-Hill Book Company, Inc.), Chap. XIII, pp. 313-316.

More accurate measures of cost are found in the standard units with which utility property is measured. Electric railways have such a unit in their track mileage, electric companies in the capacity of their power stations, and gas companies in their plant capacities or annual sales. These physical units are regularly given for a wide range of properties in the financial and technical publications. . . .

The problem of definite measures of value or cost is very much complicated by the radical changes in prices which have occurred during the past ten years. During certain portions of this period costs of equipment were more than double the costs prevailing at the beginning of the period. Progressive public utility properties have made additions to their equipment throughout this period and, therefore, show in varying degrees a composite picture of costs which is extremely difficult to check. . . .

Electric power properties show less wide fluctuations in cost per kilowatt of capacity between pre-war and present conditions, because the average size of units installed in recent years has been much larger than in pre-war years, and this larger size has resulted in a lower unit cost for power-station facilities than would otherwise be the case. To the extent that distribution systems, gas property, street-railway trackage and rolling-stock, and other similar items have been of comparable size to those purchased in earlier years, the unit costs have fluctuated more widely. So far as copper has entered into public utility construction, its prevailing low price has tended to offset to a limited extent the increased cost of other materials and of labor.

Railway Properties. Urban electric railway properties show construction costs varying normally between $50,000 and $140,000 per mile of operated track. The factors causing this wide variation in unit cost are primarily paving and traffic density, the latter calling for widely varying numbers of cars per mile of track and corresponding variations in power facilities, and storage and repair structures. In small communities with little modern paving and infrequent service the entire cost of the property per mile may, in a few cases of wholly pre-war construction, show less than $50,000 per mile. The upper limit stated of $140,000 is reached in comparatively few large cities with unusual traffic density and completely paved track. Comparatively large cities show costs in the vicinity of $100,000 per mile.

Many railways purchase power wholly or in part from other utilities and, therefore, have a lower investment. In order that the reader may have some idea of the composition of electric railway property, the following table is offered to show the normal percentages of different classes of property which make up an operating system:

TABLE 22

PERCENTAGE CLASSIFICATION OF PROPERTY IN ELECTRIC RAILWAY SYSTEM

CLASS OF PROPERTY	NORMAL RANGE OF PERCENTAGE
Track and roadway (except paving)	35 to 50
Paving	7 to 12
Distribution system	7 to 12
Rolling stock	15 to 20
Power stations, transmission, and substations	5 to 20
Storage and repair facilities and miscellaneous	6 to 11

The effect of the absence of power facilities, paving, underground distribution, and other variable factors can be judged from the above table. This table has the physical overheads distributed over its items, but does not include non-physical values, the cost of real estate or private rights-of-way, or any of the special features incident to rapid transit service. An underground rapid transit system may cost $5,000,000 or more per mile of route. Interurban railway systems cost somewhat less than city lines because of less expensive track structure, other than right-of-way cost, and low density of traffic. The cost of most of the standard interurbans has been under the minimum city unit cost above stated.

Electric Properties. The cost of urban electric power properties per kilowatt of station capacity ordinarily lies between $250 and $450 per kilowatt of rated generating capacity adequate to serve the entire system with a reasonable margin of reserve. The lower limit, which is not an irreducible one, is found in comparatively small cities where the business is reasonably compact and no underground distribution is required. The upper limit provides for underground distribution and substations in fairly large cities and their surroundings. In an unusually complicated and extensive system, including storage batteries, underground transmission, and sparsely settled outlying territory, the unit cost may materially exceed the upper limit stated. The following table gives a general picture of the distribution of the investment in electric properties among the various classes of items involved:

TABLE 23

DISTRIBUTION OF INVESTMENT IN ELECTRIC PROPERTIES

CLASS OF PROPERTY	NORMAL RANGE OF PERCENTAGE
Power station	40 to 50
Transmission lines and substations	0 to 10
Distribution system, overhead	20 to 35
Distribution system, underground	0 to 20
Services and meters	12 to 18
Miscellaneous buildings and equipment	2 to 25

Real estate is not included in the above classification because of its variable although unusually small effect. Physical overheads are distributed as in the case of the corresponding railway figures, and non-physical items are excluded.

Gas Properties. Although it is possible, with gas companies, to determine their cost per unit of manufacturing capacity, the extent of this capacity is so largely dependent upon holder capacity and load factor that it is more common to express investment in terms of annual sales to customers. The range of cost of manufactured gas plants is usually between $4 and $6 per thousand feet of annual sales. The factors affecting the unit cost are density of service (which is particularly important in a gas company), load factor, and, to a minor extent, paving requirements. Gas mains are usually laid in advance of paving or repaving, and so the capital investment in paving is comparatively small.

The distribution of the investment in a normal gas property among various classes of items is approximately shown in the following table:

TABLE 24

DISTRIBUTION OF INVESTMENT IN GAS PROPERTIES

CLASS OF PROPERTY	NORMAL RANGE OF PERCENTAGE
Manufacturing plant and holders	42 to 55
Distribution system	30 to 42
Services and meters	12 to 18
Miscellaneous buildings and equipment	2 to 7

86. A Comparative Cost and Income Statement

TABLE 25

THE PEOPLES GAS LIGHT AND COKE COMPANY *

Four Year Period

	1923 Cu. Ft. Gas	1924 Cu. Ft. Gas	1925 Cu. Ft. Gas	1926 Cu. Ft. Gas
Gas Produced at Producing Stations	16,169,836,000	19,836,121,000	11,994,751,000	13,797,101,000
Gas Produced at Experimental Station		9,986,000		
Total Gas Produced	16,169,836,000	19,846,107,000	11,994,751,000	13,797,101,000
Gas Purchased	15,130,507,000	13,527,200,000	21,811,703,000	23,538,038,000
Gas in Holder	31,300,343,000	33,373,307,000	33,806,454,000	37,335,139,000
Gas in Holder Stock Adjustment	[a] 1,898,000	[a] 118,000	[a] 4,698,000	[a] 10,719,000
Gas Sent Out	31,298,445,000	33,373,189,000	33,801,756,000	37,324,420,000
Gas Sold	29,791,110,822	31,621,305,748	32,500,781,806	35,687,863,592
Gas Unaccounted For	1,507,334,178	1,751,883,252	1,300,974,194	1,636,556,408

[a] Deduction.

* *Annual Report to the Stockholders*, 1926, p. 18.

(*See next page*)

TABLE 25 (*Continued*)

THE PEOPLES GAS LIGHT AND COKE COMPANY

Four Year Period

	TOTAL COST	CENTS PER M	TOTAL COST	CENTS PER M	TOTAL COST	CENTS PER M	TOTAL COST	CENTS PER M
Gas Produced								
Steam Cost	$ 404,567.35	2.50	$ 414,975.66	2.09	$ 229,245.59	1.91	$ 232,939.52	1.69
Generator Fuel	3,175,155.82	19.63	3,327,796.99	16.77	1,775,959.29	14.81	1,886,139.17	13.67
Water Gas Oil	2,041,651.32	12.63	2,554,574.45	12.87	1,629,377.36	13.58	1,928,571.73	13.98
Purification Supplies	76,011.62	.47	83,311.71	.42	38,209.39	.32	35,870.80	.26
Miscellaneous Works Expense	109,099.43	.67	114,685.14	.58	79,124.96	.66	72,936.53	.53
Production Labor	577,044.74	3.57	673,465.19	3.39	370,527.60	3.09	356,433.93	2.58
Plant and Equipment Main. and Repairs	408,956.25	2.53	380,644.49	1.92	238,330.56	1.99	219,674.40	1.59
Superintendence	167,212.22	1.03	144,663.52	.73	119,209.00	.99	124,300.95	.90
Engineering Dept. General Charges	214,441.91	1.33	156,527.22	.79	68,622.40	.57	72,651.07	.53
Cost of Gas Prod. at Producing Stations	7,174,140.66	44.36	7,850,644.37	39.56	4,548,606.15	37.92	4,929,518.10	35.73
Cost of Gas Prod. at Exper. Station			2,596.36	.01				
Cost of Total Gas Prod.	7,174,140.66	44.36	7,853,240.73	39.57	4,548,606.15	37.92	4,929,518.10	35.73
Credit for Residuals Produced.	191,399.48	1.18	291,134.53	1.47	205,811.22	1.71	196,594.95	1.43
Net Cost of Gas Prod.	6,982,741.18	43.18	7,562,106.20	38.10	4,342,794.93	36.21	4,732,923.15	34.30
Cost of Gas Purchased	5,171,400.72	[a] 4.35	4,791,809.50	[a] 1.08	7,424,683.90	[a] 1.40	7,582,460.34	[a] 1.31
Cost of Gas in Holder	12,154,141.90	38.83	12,353,915.70	37.02	11,767,478.83	34.81	12,315,383.49	32.99
Cost of Gas in Holder Stock Adjustment	328.53		811.73		394.40		[a]5,278.78	[a].01
Cost of Gas Sent Out	12,154,470.43	38.83	12,354,727.43	37.02	11,767,873.23	34.81	12,310,104.71	32.98
Unaccounted For Gas		1.97		2.05		1.40		1.51

Cost of Gas Sold	12,154,470.43	40.80	12,354,727.43	39.07	11,767,873.23	36.21	12,310,104.71	34.49
Transmission and Distribution Expenses	2,188,722.87	7.35	2,471,619.18	7.82	2,249,563.13	6.92	2,212,520.17	6.20
Commercial Expenses	1,746,099.78	5.86	1,824,792.37	5.77	1,826,106.56	5.62	1,958,935.94	5.49
New Business Expenses	438,812.77	1.47	571,487.64	1.81	635,493.23	1.96	771,115.80	2.16
General and Miscellaneous Expenses	2,699,889.95	9.06	2,714,150.36	8.58	2,846,884.04	8.76	3,158,480.22	8.85
Retirement Expenses	1,232,020.15	4.14	1,297,678.83	4.10	1,321,032.71	4.06	1,427,079.18	4.00
Contingency Expense	293,338.14	.98	154,484.67	.49	314,531.59	.97	339,780.74	.95
Oper'g Cost to Burners	20,753,354.09	69.66	21,388,940.48	67.64	20,961,484.49	64.50	22,178,016.76	62.14
Other Deductions:								
Taxes	2,289,238.14	7.68	2,259,324.47	7.15	2,400,000.00	7.38	2,778,553.00	7.79
Uncollectible Bills	223,926.07	.75	152,061.79	.48	153,929.06	.47	163,159.67	.46
Rent for Leased Plant and Equipment	1,104,941.69	3.71	1,131,317.18	3.58	1,259,463.57	3.88	1,296,011.85	3.63
Int. on Ogden Gas Co. Bonds Guar.	300,000.00	1.01	300,000.00	.95	300,000.00	.92	300,000.00	.84
Amortized Rents	204,637.20	.69	204,637.20	.65	204,637.20	.63	204,637.20	.57
Misc. Deductions	41,122.34	.14	96,100.22	.30	104,811.93	.32	104,056.17	.29
Cost of Gas Delivered to Consumers	24,917,219.53	83.64	25,532,381.34	80.75	25,384,326.25	78.10	27,024,434.65	75.72
Interest on Funded Debt	2,357,850.00	7.92	2,643,433.34	8.36	2,702,850.00	8.32	2,702,850.00	7.57
Interest on Unfunded Debt	36,785.46	.12	41,860.58	.13	29,483.61	.09	16,562.11	.05
Total cost of Gas Delivered to Consumers	$27,311,854.99	91.68	$28,217,675.26	89.24	$28,116,659.86	86.51	$29,743,846.76	83.34
Income:								
Income from Gas	$30,615,187.98	102.77	$31,329,895.39	99.08	$31,854,551.72	98.01	$33,920,195.51	95.05
Income from Other Sources	895,180.98	3.00	1,163,128.07	3.68	1,114,631.33	3.43	932,896.59	2.61
Total Income	$31,510,368.96	105.77	$32,493,023.46	102.76	$32,969,183.05	101.44	$34,853,092.10	97.66
Net Earnings	$ 4,198,513.97	14.09	$ 4,275,348.20	13.52	$ 4,852,523.19	14.93	$ 5,109,245.34	14.32

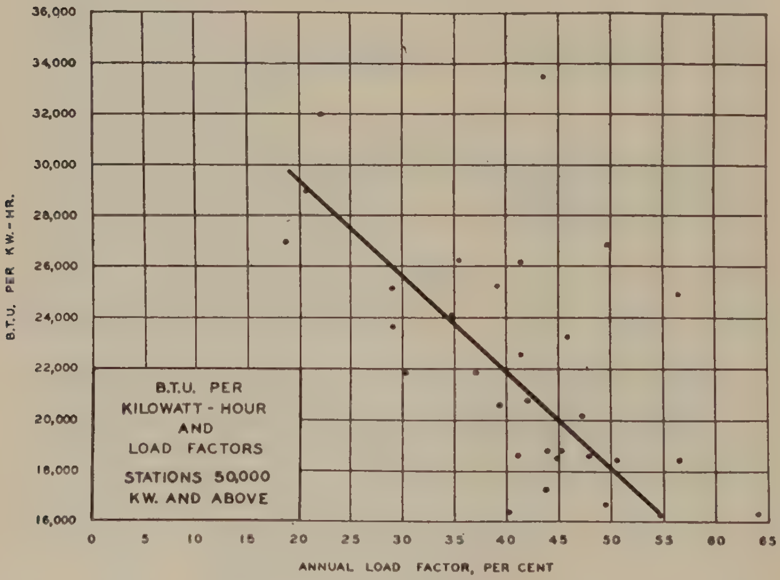
87. Operating Performance of Steam-Generating Stations *

The real standards by which to judge the design of any particular power station are:

1. Fuel cost.
2. Cost of operating labor and superintendence.
3. Cost of maintenance.
4. Fixed charges on the investment.

The *Electrical World* has performed a real worthwhile service for all of us by gathering together data covering the operating performance of 136 coal-burning generating stations; these records in most cases covering the calendar year 1924. The data submitted herewith give all of the information that is necessary to analyze operating costs made up of items 1, 2 and 3, referred to above. It would be of very real interest if we could also have the yearly fixed charges in connection with these different stations, but these figures are not available.

Chart 29



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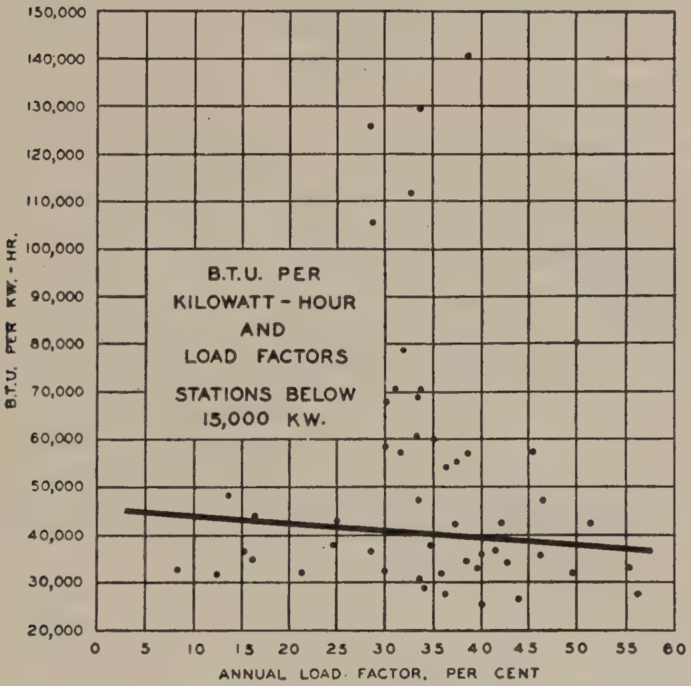
* Excerpts from article by Vern E. Alden, *Electrical World*, XXCVI (Sept. 26, 1925), 633-648.

The capacity of the 136 coal-burning stations on which data were compiled total 4,742,657 kilowatt, and the total output of these stations for the year reaches a total of 12,657,068,000 kilowatt-hours. It is to be noted that the output of these stations is approximately 36 per cent of the total output of all the steam-generating stations in the United States. The investment in all the stations reported upon probably totals in excess of $500,000,000. The different stations reported upon range in capacity from 187,500 kilowatt down to 225 kilowatt. It is of interest to note that the annual yearly output ranges from 816,800,000 kilowatt-hours in connection with one of the large stations, down to 290,000 kilowatt-hours in connection with one of the small stations. The performance ranges all the way from 16,326 B.t.u. per kilowatt-hour up to 140,000 B.t.u. per kilowatt-hour.* It is

Chart 30



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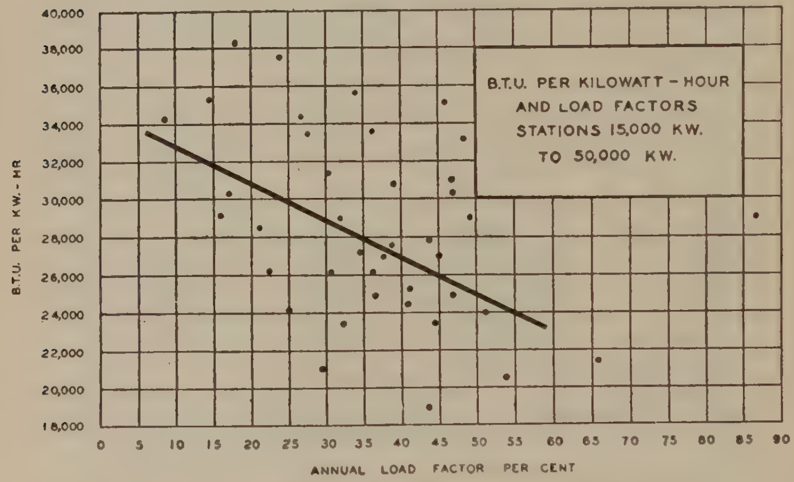
* EDITOR'S NOTE: B.t.u. (British Thermal Unit) is a unit representing the amount of heat required to raise one pound of water one degree Fahrenheit from and at 212 degrees F. One pound of coal will contain from 10,000 to 15,000 B.t.u. depending upon the grade of coal. Hence, rating

doubtful if any better cross-section showing the operating practice in connection with steam-generating stations in this country has ever been prepared. . . .

Effect of Load Factors on Station Performance. We wished to form an opinion as to whether annual load factor bore any consistent relation to station performance. Charts 29, 30, and 31 show the performance of the different stations (B.t.u. per kilowatt-hour) plotted against annual load factor, as abscissa. As to be expected, there is a very wide spread in the performance figures for the different stations. We found this to be true in all the different analyses that we made. It is to be noted that for purpose of analysis the stations have been divided into three different groups: those having a capacity of 50,000 kilowatt, or higher; those having capacities ranging between 15,000 kilowatt and 50,000 kilowatt, and those having a capacity of less than 15,000 kilowatt. Weighted average lines drawn in on Charts 29 and 30 show a distinct trend toward better performance in connection with those stations operating on the higher annual load factor. This trend is due to two things:

Chart 31



1. In connection with all of the larger system, the older sta-

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stations on the basis of B.t.u. per kilowatt-hour becomes an expression of the operating efficiency of that station. For comparative purposes the B.t.u. per kilowatt-hour is desirable since it eliminates discrepancies in grades of coal used.

tions, which are not capable of as good performance as some of the newer stations, are being assigned by the load dispatchers to carry the peaks of the system load, whereas the newer and more efficient stations are having assigned to them the job of carrying the base load.

2. The fact of low load factor, with the resulting frequent starting and stopping of the turbines and auxiliaries, the frequent banking of boilers, the operation of equipment at less than its most efficient load, accounts for a higher B.t.u. per kilowatt-hour in connection with any particular station than would correspond to operation with a somewhat higher load factor under different conditions.

We believe that the first consideration is more important as affecting the slope of the lines drawn in on Charts 29 and 31 and we wish to point out definitely that in connection with any particular station the effect of the change in load factor on station performance would not be nearly so marked as might be indicated from an inspection of the above-mentioned charts.

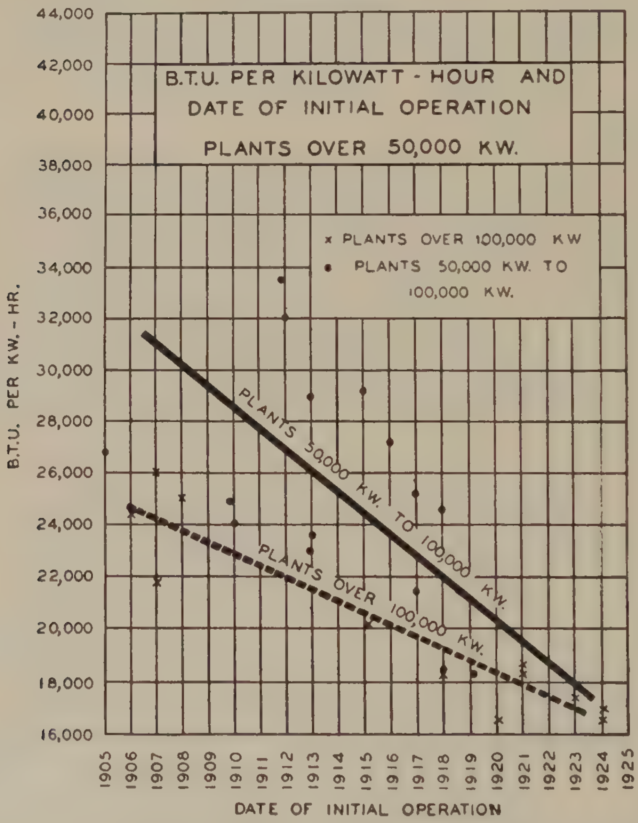
Chart 30, covering the performance of smaller stations, does not show the same consistent trend as do 29 and 31. It is probable that other influences have entered that have had a more important bearing on station performance than has the effect of load factor.

Effect of Size of Station on Station Performance. It is of interest to compare the values of station performance for stations of different sizes and this comparison shows, from an inspection of Charts 29, 30, and 31, that corresponding to an annual load factor of 40 per cent, the station performances are as follows:

	B.T.U. PER KW.-HR.
For stations of 50,000 kw. and higher	22,000
For stations from 15,000 kw. to 50,000 kw.	27,000
For stations of 15,000 kw. and less	40,000

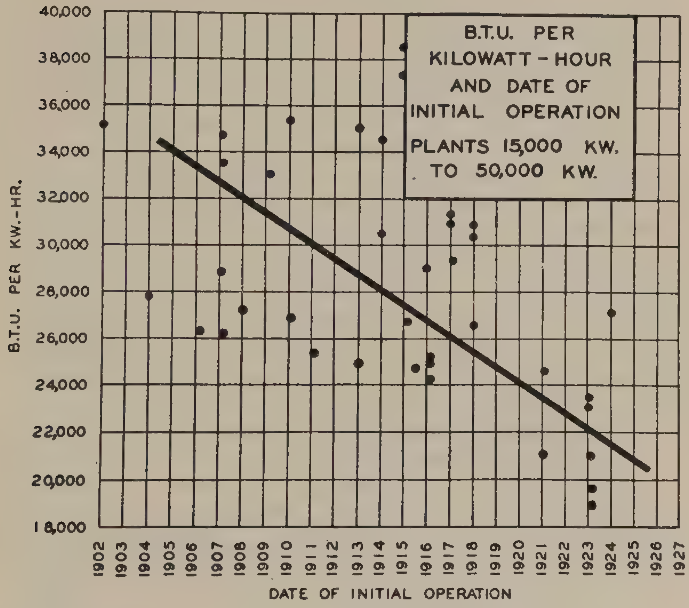
We wished to determine whether the newer stations being built from year to year are showing progressively better performance and with this idea in mind, Charts 32, 33, and 34 were plotted. The date of initial operation was plotted as the abscissa, and station performance as the ordinate. It is to be noted that in connection with each of these three charts there is a definite trend toward better station performance in connection with those stations more recently placed in service. In connection with Chart 32, covering the performance of stations having a capacity of 50,000 kilowatt and higher, we have clearly indicated the stations that fall into the class of 100,000-kilowatt capacity and higher, and it is to be noted that these stations show appreciably better station performance than stations falling in the class beween 50,000 kilowatt and 100,000 kilowatt in capacity. A comparison of these charts will show a convergence of the lines representing the weighted average performance of the stations falling in the different classifications as regards performance and probably present better than anything else that has ever been published the tangible evidence of the results of the hard work of designing engineers in striving after better station performance. . . .

Chart 32



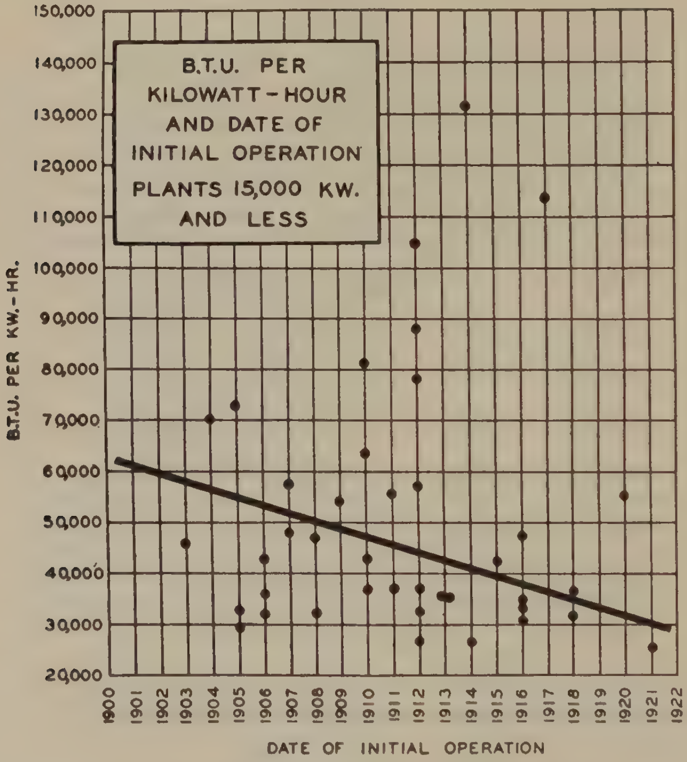
Effect of Fuel Expense on Total Operating Costs Per Kilowatt-Hour. The results of our analysis to determine the relation between fuel cost and total operating cost (fuel, wages and superintendence, water, lubrication and supplies, and miscellaneous) per kilowatt-hour are shown in Chart 35. The relation is shown in a very clear-cut manner. It is of particular interest to note that this relation is somewhat different for stations that fall in three different classifications as regards capacity. For example: Corresponding to a total operating cost of 1 cent per kilowatt-hour for stations of 50,000 kilowatt and higher, the fuel cost is 0.78 cent or 78 per cent of the total; for stations from 15,000-kilowatt to 50,000-kilowatt capacity, the fuel cost is 0.72 cent per kilowatt-hour; and for stations of 15,000-kilowatt and lower, the fuel cost is 0.63 cent per kilowatt-hour. As is to be expected, the differential between fuel cost and total operating cost decreased in connection with the larger stations, this being due to the decreased amount of operating labor incident to the use of larger generating units and larger boilers. . . .

Chart 33



Effect of Plant Use Factor on Maintenance Costs. The costs of operating labor and superintendence and of maintenance bear about equal importance as elements entering into the total operating costs. Neither of these factors, of course, is of the same magnitude as the fuel costs. We felt that maintenance costs should bear a very direct relation to plant-use factor and, in order to verify our suspicions, we made the analyses. . . .

Chart 34

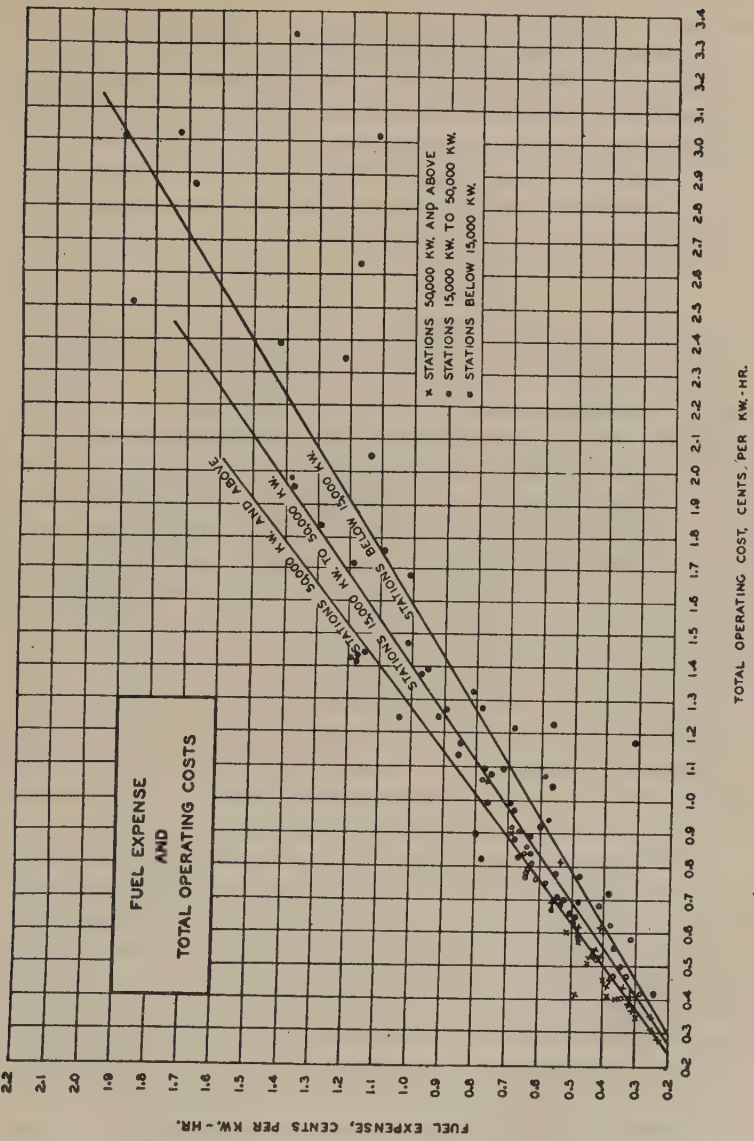


Charts 36 and 37 show a clear-cut trend toward lower maintenance costs in connection with those stations having higher plant-use factors. There are two reasons for this trend:

1. A considerable amount of maintenance is necessary regardless of the number of kilowatt-hours generated by the station during the year. If this expense is spread over the large number of kilowatt-hours corresponding to a high-use factor, the cost per kilowatt-hour is decreased.

2. Frequent starting and stopping of turbines and long

Chart 35


FUEL EXPENSE
AND
TOTAL OPERATING COSTS
× STATIONS 50,000 KW. AND ABOVE
● STATIONS 15,000 KW. TO 50,000 KW.
● STATIONS BELOW 15,000 KW.
STATIONS BELOW 15,000 KW.
STATIONS 15,000 KW. TO 50,000 KW.
STATIONS 50,000 KW. AND ABOVE
FUEL EXPENSE, CENTS PER KW.-HR.
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
TOTAL OPERATING COST, CENTS PER KW.-HR.
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4

banking periods on boilers and stokers, which may be incident to low plant-use factors, result in a more rapid deterioration of equipment and increased cost for maintenance.

Effect of Station Capacity on Maintenance Costs. A comparison shows the effect of station capacity on maintenance costs per kilowatt-hour corresponding to an annual plant-use factor of 40 per cent. The maintenance costs are:

	Cents per Kw.-Hr.
For stations of 50,000 kw. and higher................	0.065
For stations from 15,000 kw. to 50,000 kw............	0.078
For stations of 15,000 kw. and smaller...............	0.14

The increase in maintenance costs for the smaller stations is probably tied-up with the use of smaller generating units and smaller boilers, together with the higher total investment per unit of installed capacity. . . . It is important that we bear in mind the relative magnitude of the different elements entering into the cost of power-station operation, and in this connection it is to be noted that for the eleven stations referred to here the maintenance in connection with the boiler plant is 54 per cent of the total maintenance costs—bulking larger than the combined maintenance in connection with the prime movers and their auxiliaries, generators and electrical equipment, buildings and structures, and miscellaneous equipment in the power station. If figures were available, we are sure they would show that a large percentage of this maintenance cost in connection with boiler-plant equipment is in connection with the furnaces. This indicates the wisdom of certain constructive steps that are being taken at the present time to modify furnace design so as to reduce furnace maintenance to a minimum.

It would appear that there should be a rather definite relation between the cost of coal per million B.t.u. and the operating performance for which new stations are being designed—namely, the higher the cost of coal the more money the designing engineer is justified in putting into the station in order to get good operating performance. . . . It is rather an odd fact, however, that the four stations in connection with which the highest station performance has been obtained are all burning comparatively cheap coal. Two answers suggest themselves:

1. Perhaps it is really true, as has been suggested a number of times, that with careful design it is possible to build a station for a performance of 16,500 B.t.u. or 17,000 B.t.u. and actually obtain a lower investment than in connection with a sta-

tion designed for less—say 18,500 B.t.u. per kilowatt-hour performance.

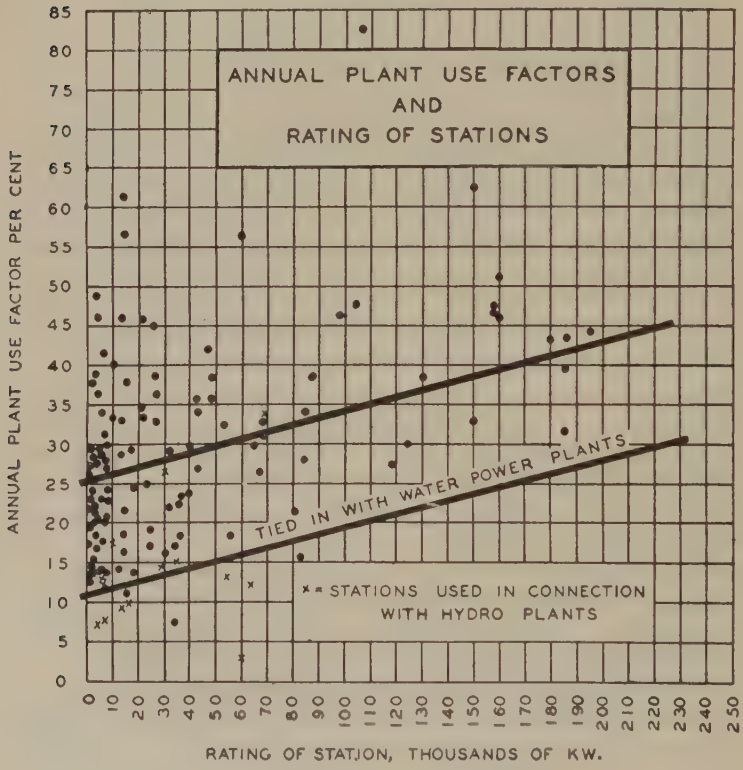
2. Perhaps all of our designing engineers and executives are not watching their investment and fixed charges as closely as they might and they may be permitting high station-performance to become an end in itself rather than a means to an end. The question of whether extreme refinements in station design, in order to obtain the lowest possible fuel consumption, are justified is one that is certainly open to argument, particularly in connection with those stations located closely adjacent to ample supplies of cheap coal.

Effect of Station Capacity on Annual Plant Use Factor. Although no figures were available as to the investment costs in connection with the different steam-generating stations and any judgment as to fixed charges per kilowatt-hour was a matter of conjecture, we were curious to see the relation of the different factors that affect fixed charges. It is to be realized, of course, that in connection with most of our modern stations the fixed charges per kilowatt-hour are as high as or higher than the fuel cost. In Chart 36 we plotted as abscissa the capacity of the station and as an ordinate the annual plant-use factor. A distinction was made in connection with those stations that are tied-in with one or more water-power plants, as automatically the annual plant-use factor in connection with these stations is decreased due to the favoring of the water-power plants. It is to be noted that in connection with both classes of steam-generating stations there is a consistent trend for the annual plant-use factor to increase with the rating of the station. In other words, the dollar of invested capital is used more efficiently in connection with the large stations than it is in connection with the small stations. This is probably the result of diversity.

Effect of Vintage of Station on Annual Plant-Use Factor. We wanted to know whether the annual plant-use factor is gradually decreasing in value as stations become older. . . . There is a clear-cut trend indicating that stations placed in operation twenty years ago have annual plant-use factors of only about 55 per cent value of the annual plant-use factors of stations placed in operation during the last two or three years. . . .

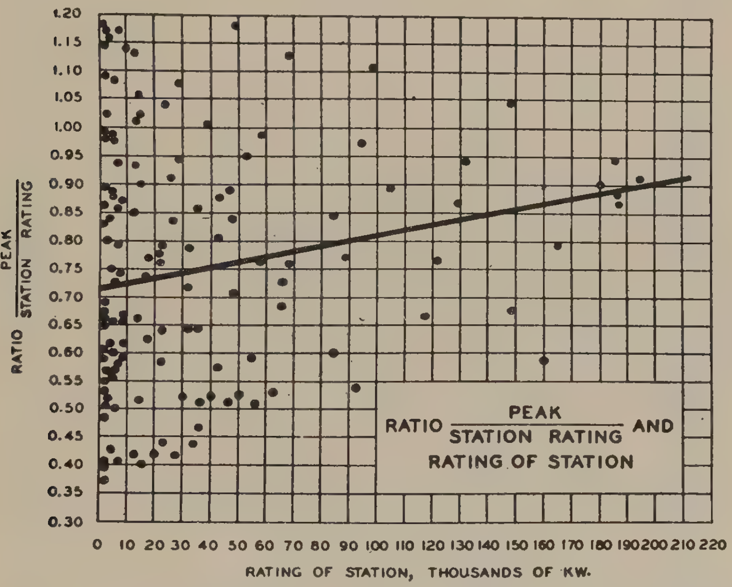
Only six of the 136 generating stations have annual plant-use factors in excess of 50 per cent. It is to be noted that four of the six stations that have annual plant-use factors in excess of 50 per cent have been in service five years or less. This is just one more indication that the burden of proof is on the designing engineer who attempts to justify recommendations to his executives for increased investments on the basis of savings in fuel consumption to be effected, assuming annual plant-use factors of 50 per cent or higher. We are perfectly safe in stating that only where there is an extremely favorable set-up can it be expected that a station will operate for a long period of time with an annual plant-use factor in excess of 50 per cent. Most stations now being designed will average more nearly during the first twenty years of their life an annual plant-use factor of 40 per cent.

Chart 36



Effect of Station Rating on Percentage of Spare Capacity. We wished to know whether the percentage of spare capacity allowed in connection with different stations bore any relation to station capacity. . . . A definite trend was indicated (Chart 37), approximately 26.5 per cent of the station capacity being idle in connection with stations of 10,000-kilowatt capacity, corresponding to the time of the system peak, while in connection with stations of 180,000-kilowatt capacity, only 11 per cent of the capacity was idle at the time of the system peak. Here again we see the effect of what is probably diversity entering in to allow of a more efficient use of each dollar of invested capital in connection with large steam-generating stations.

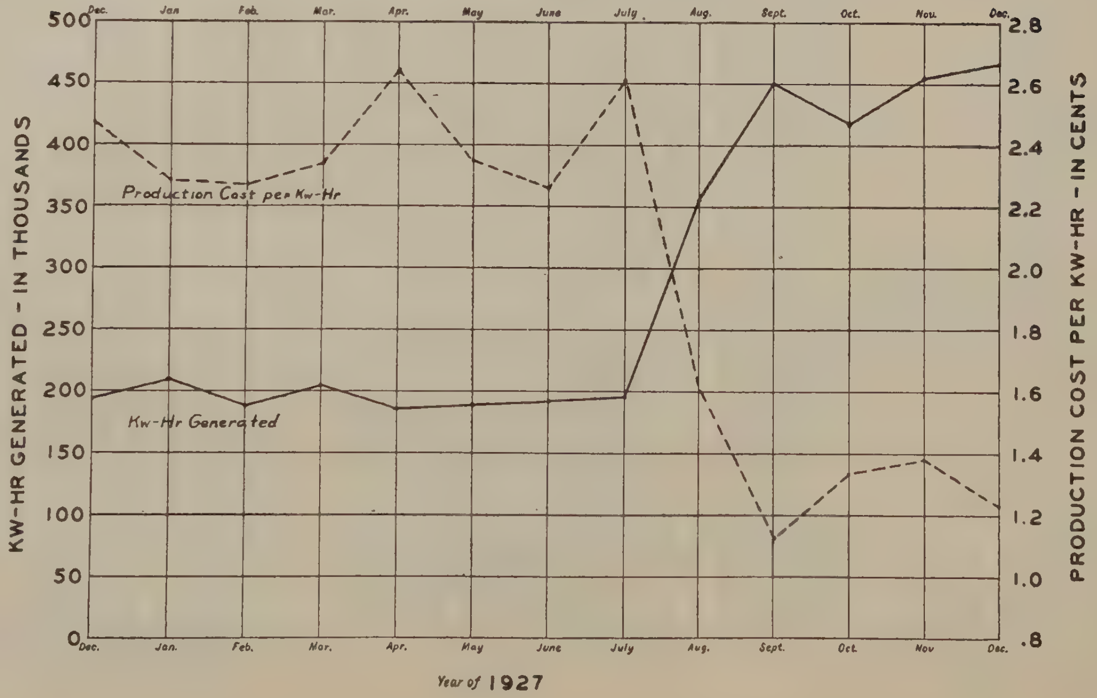
Chart 37



It is of interest to compare the operation of a group of the small stations with one of the large stations and with this thought in mind, we have taken as a group stations Nos. 74 to 136, inclusive. The total generation in connection with these 63 stations is 656,018,000 kilowatt-hours. It is to be noted that station No. 4 generated 640,750,000 kilowatt-hours, which is approximately the same as the combined generation for the 63 smaller stations. The combined rating of the 63 smaller stations was 288,777 kilowatts. The rating of station No. 4 is about 190,000 kilowatts. The probable investment in connection with the 63 smaller stations is in the neighborhood of $49,000,000. The probable investment in connection with station No. 4 is of the order of $19,000,000. Taking the fixed charges at 13 per cent, the fixed

Chart 38

KILOWATT-HOURS GENERATED AND PRODUCTION COST PER KILOWATT-HOUR



charges per kilowatt-hour in connection with the power generated by the 63 smaller stations are 0.97 cent and the fixed charges per kilowatt-hour in connection with station No. 4 are 0.385 cent. These fixed charges, of course, reflect the average plant use factor, which, in connection with the 63 smaller stations, averaged 26 per cent, whereas the average plant use factor in connection with station No. 4 was 40 per cent. The total of operating costs and maintenance in connection with station No. 4 was 0.516 cent per kilowatt-hour, whereas the corresponding average costs in connection with the 63 smaller stations for substantially the same total annual generation were 1.19 cents per kilowatt.

Large Station Most Economical. In the preceding paragraph we have a clear-cut picture as to the advantages of using a single large generating station instead of a group of smaller generating stations. It is to be borne in mind, of course, that we have sized up these changes solely from the standpoint of a steam-generating station, without relation to the geographical proximity of the station to its load. It is possible, of course, that considerations of investment in transmission and distributing lines may make the installation of a number of smaller stations worth while. With increasing load densities and tying together of existing systems, we shall more and more come to the use of a few large stations rather than a large number of smaller stations, and the analysis in the preceding paragraph clearly shows the reason.

88. Increased Economy Warrants Increased Investment *

Increased efficiency of steam-generating plants depends fundamentally upon increasing the heat content in the steam, thereby increasing the ratio of useful heat to waste heat. This result may be attained by increasing the pressure and temperature of the steam. During the past few years steam pressures have been more than doubled. . . .

The increased economy of the prime movers has hastened the tendency to abandon steam-driven auxiliaries in favor of motor-driven auxiliaries. The feed water that was formerly heated by the exhaust from the auxiliaries is now being heated in several stages by steam that has done much work in the turbine. The extraction cycle has been developed to extract steam from three or four stages. . . .

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* From article by C. W. DeForest, *Electrical World*, XXCVI (Sept. 26, 1925), 605-607.

The tendency at the present time seems to be toward pulverized fuel and reports from stations that have adopted this method of burning coal clearly indicate a distinct gain in boiler efficiency under the particular conditions over stoker installations.

These improvements have increased the cost of power plants, but not to the extent that might be expected at first thought. The more efficient turbine requires less boiler capacity and less condensing equipment than the less efficient turbine. The cost of operation exclusive of coal and fixed charges will not be greatly different in the one plant than in the other.

The vital question is this: Does the economy of fuel effected justify the increased investment? It is thought by some engineers and by those responsible for the financing of some of these highly efficient power stations that too much money is being expended for efficiency—in fact, that the gain in thermal economy is more than offset by the carrying charges on the increased investment. If this is so, it is evident that the more expensive, highly efficient station results in a direct loss.

The cost of producing electrical energy is made up of fixed charges on the investment and operating costs. In order for a plant to be more economical the decrease in fuel cost must more than equal the fixed charges on the increased investment. Four factors enter into the decreased cost of fuel—namely: (1) B.t.u. per kilowatt-hour saved by the more efficient plant; (2) load factor or capacity factor at which the plant will operate; (3) B.t.u. per pound of coal as fired; (4) cost of coal per ton fired to furnace.

The fixed charges depend upon the rate of fixed charges which apply to the particular case.

The curves on the attached sheet have been worked out to show the cost per kilowatt of capacity justified by a given gain in the thermal efficiency taking into account the variables noted above. Stations operating at 250 to 300 pound steam-pressure at a total temperature of 600 degrees Fahrenheit average from 19,000 to 21,000 B.t.u. per kilowatt-hour sent out. The new stations of to-day using a steam-pressure of 550 to 600 pounds and superheat and reheat to 750 degrees Fahrenheit extracting steam from three or four stages of the turbine for feed-water heating, using air heaters and possibly pulverized fuel, will operate at 14,000 B.t.u. or less per kilowatt-hour sent out.

If we assume a saving of 6000 B.t.u. per kilowatt-hour output, a base load station having a yearly load factor of 70 per cent, coal averaging 13,500 B.t.u. per pound as fired, costing $4 per ton delivered to the furnace, and 12 per cent fixed charges, the curves show that we could afford to spend $46 per kilowatt of capacity installed to obtain the increased thermal efficiency. If coal cost $5.50 per ton delivered to the furnace, the same station would justify an increased investment of $62 per kilowatt of capacity, or $10.33 for each 1000 B.t.u. saving per kilowatt-hour.

Take a case, for example, of a station that would show a saving of 4000 B.t.u. per kilowatt-hour, an annual load factor of 50 per cent using coal of 13,000 B.t.u. at $4 per ton, the justified increased investment cost would be $23 per kilowatt of capacity, or $5.75 for each 1000 B.t.u. saving per kilowatt-hour. These figures show that quite a large investment is warranted.

Increased Cost of Modern Stations Not Excessive. When the lesser capacity that is required in boilers, condensers, coal handling, and coal storage equipment, as well as the decreased size of the building, is taken into consideration, the increased cost of the modern station previously described would be only $7 to $10 per kilowatt capacity as compared with the station designed for 250 to 300 pound pressure, and it is believed that in future stations the relatively small increased cost per kilowatt of capacity for the present high-pressure stations will be reduced if not entirely eliminated. In fact, it is difficult to find any increased cost per kilowatt of capacity for the present high-pressure stations. There are in the country today many large stations of moderate pressure, the cost of which per kilowatt of capacity exceeds that of the present 600-pound stations.

The cost of coal used in calculating the operating cost of the station should be the cost per ton delivered to the furnace, including the following factors, which should be added to the cost per ton of coal f.o.b. the plant:

(1) Cost of unloading, including maintenance of equipment, cost of storage, loss in storage and carrying charges on storage; (2) cost of conveying; (3) handling of ash; (4) proportion of stoker maintenance; (5) cost of crushing, including maintenance, and (6) some proportion of boiler operation and brickwork maintenance. If pulverized fuel is used, the cost of coal preparation should be added. The total cost of these items will vary over quite a range, dependent on the design of equipment, methods employed and amount of coal carried in storage by the station in question, but the amount of money that should be added to the cost f.o.b. plant will run from $0.50 to $0.80 per ton.

The load factor or capacity factor at which the station will operate has a very direct bearing on the problem. There are some plants in this country that have operated on a capacity factor of 70 per cent and better. On many of the larger systems there is the opportunity to construct real base-load stations of the right capacity to fit into the base-load of the system, and with proper management should continue to operate at the highest capacity consistent with proper maintenance until such time as they are replaced by a more efficient station. However, a highly efficient base-load station will not be superseded unless designing engineers produce the better station.

Public utilities have always been leaders in progress and their phenomenal growth has been due almost entirely to increased efficiency in service, in the use of electrical power and in the generation of electrical power. The costs of fuel, labor and every kind of material used by the utility has greatly increased, while the cost of electric service to the public has decreased. This has been made possible by efficiency not only in generation of power, but in all of the various departments of the business.

It would appear that the conservation of the national fuel supply alone would justify any increased investment cost for generating stations that will result in a fuel saving equal to the carrying charges on the investments in the more efficient plants.

89. The Behavior of Costs in the Telephone Industry *

It is the purpose of this chapter to analyze the manner in which costs behave when the number of subscribers served by a telephone exchange is increased. It will be necessary in this connection to examine into the nature of the costs incurred so as to determine the factors with which each item of expense varies. The most useful classification of costs for this purpose is that . . . which attempts to divide costs into three classes in accordance with the factors responsible for their incurrence. This classification is as follows:

1. Those costs dependent on the mere provision of facilities in readiness to serve the customer.
2. Those dependent on giving service to the customers, although independent of the amount given.
3. Those dependent on the amount of service given.

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* Excerpt from Barclay J. Sickler, *Pricing the Telephone Service*, Chap. V. Thesis presented for M.B.A. Degree, Northwestern University, School of Commerce, 1927.

Costs cannot be accurately divided into these three classes, of course, for scarcely any one item of cost depends solely upon any one of these factors. This concept of the dependence of cost is largely an abstraction, and many concrete items of cost are composed of elements dependent on two or all of these variants. In addition, it cannot be said that these factors are the only ones with which costs vary. There may be numerous others, but these three include the most important causes of variation. It will be possible to make a fairly close approximation to a classification of costs on this basis, although a high degree of exactness probably cannot be obtained. . . .

The Relation of Output Costs to the Number of Subscribers. The behavior of costs dependent upon output will be examined first. Such costs depend upon the number of calls, rather than upon the number of subscribers. There seems to be no necessary reason for the cost of giving service per call to increase with the number of subscribers. Table 26 discloses no tendency for this to occur, save perhaps in the case of central office maintenance. However, with an increase in the number of subscribers there will undoubtedly be a larger proportion of calls trunked, especially in larger exchanges, than those considered in this study. Up to the point where there are five or six thousand subscribers there need be no trunking. After this point it is necessary either to establish two central offices, with trunking between them, or to put in a sending and a receiving switchboard having connecting trunks. This causes an increase in operating costs due to the necessity of using two operators. F. J. Dommergue[1] estimates that it takes once and a half as much of the operator's time to handle a trunked call as a local call.

Also, with an increased number of subscribers, the quality of service demanded increases. Business men in larger places require much speedier and more accurate service than is demanded in smaller places or by residence users. They also insist on much faster and better maintenance and repair service. Matters of much greater importance depend upon the telephone service in larger cities, and the time of business men is more valuable. . . .

The number of calls each subscriber makes would probably increase with an increased number of subscribers up to a certain point, for more opportunities to call would exist. This would cause output costs per subscriber to increase, although not costs per call. This tendency of calls per subscriber to increase with an increased number of possible calls has apparently been taken

[1] *Manual Traffic Studies: Telephone Engineering*, XXIX (Nov. 1925), 17.

TABLE 26

Output Costs per Call and per Telephone in Exchanges of the Wisconsin Telephone Company

Dec. 31, 1915

Class	Number of Exchanges	Total Output Costs per 100 Calls	Operator Wages per 100 Calls	Other Traffic Costs per 100 Calls	Central Office Maintenance per 100 Calls	Output Costs per Telephone	Traffic Costs per Telephone	Central Office Maintenance per Telephone
0–1000	55	.2037	.1288	.0557	.0192	3.95	3.56	.39
1000–2000	11	.1534	.1027	.0311	.0196	3.24	2.83	.41
2000–3000	4	.1952	.1264	.0451	.0237	4.02	3.50	.52
3000–4000	3	.1727	.1174	.0336	.0217	4.09	3.53	.56
4000–5000	2	.1782	.1136	.0403	.0243	4.86	4.20	.66
5000–6000	..	....	....	....	....	...	...	..
6000–7000	1	.1955	.1236	.0456	.0263	4.16	3.61	.55
7000–8000	1	.1959	.1201	.0538	.0220	5.16	4.48	.68

for granted in the past. It is probably true for exchanges up to a certain size, but there is serious reason to doubt that the increase continues after this certain size has been reached. The average subscriber only wishes to call a certain number of people, and after a certain point, added subscribers probably include but few of these. It is difficult to determine the extent to which increased size causes an increased number of calls per day, for so many other factors affect the calling rate. Data for different exchanges of varying size is almost useless, due to the varying conditions present. The only way even to approximate a definite result would be to take data for the same exchange during a period of growth. These data are not readily available, it being possible to secure them for Chicago only. The data secured bear out the contention that increasing size does not necessarily increase the calling rate, although a greater development of measured service partially accounts for the results.

TABLE 27

CALLS PER TELEPHONE IN CHICAGO *

YEAR	NUMBER OF TELEPHONES	CALLS PER TELEPHONE PER DAY	YEAR	NUMBER OF TELEPHONES	CALLS PER TELEPHONE PER DAY
1917	474,567	5.1	1922	613,359	4.6
1918	467,298	4.5	1923	657,081	4.8
1919	522,443	4.2	1924	718,881	4.7
1920	537,245	4.2	1925	757,784	4.6
1921	587,644	4.2	1926	811,026	4.7

Accepting the calls per subscriber as a measure of the value of the service, if it is true that after a certain stage they do not increase with increased subscribers, or even if they do not increase at as great a rate as do the costs per telephone, it means that the value of the service to the subscriber does not increase as rapidly as the rates he must pay. The consumer's surplus will constantly be diminishing. Calls per subscriber can hardly be accepted as a true measure of the value of the service, however. The value of the individual call may vary within wide limits, and probably rises with an increased number of subscribers. Business service ordinarily increases with the size of the exchange and the value of each call in this class of service is much greater than in residence service. There is also a certain value in

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* Figures supplied by the Illinois Bell Telephone Company.

the greater number of possible calls which exist in the larger exchanges which must be disregarded. It is possible that the condition suggested does exist, however, and it may have an important effect on tendencies in rate-making in the future.

The Effect of Increased Size on Customer Costs. The relation of the costs dependent upon the existence of the customer to an increase in the number of subscribers does not appear to be one which would cause an increase in cost per subscriber. Rather the contrary, for it appears that more efficient methods of accounting, billing, collecting, and so forth could be adopted with increasing output. The data in Table 28 show no tendencies in either direction. The fact that increasing size causes a greater use of measured service might cause these expenses to show some tendency to increase had larger exchanges been considered.

TABLE 28

CUSTOMER COSTS PER TELEPHONE IN EXCHANGES OF THE WISCONSIN TELEPHONE COMPANY

Dec. 31, 1915

CLASS	NUMBER OF EXCHANGES	CUSTOMER COSTS PER TELEPHONE	COMMERCIAL EXPENSE PER TELEPHONE	GENERAL EXPENSE PER TELEPHONE
0–1000	55	$2.28	$1.73	$0.55
1000–2000	11	2.17	1.61	.56
2000–3000	4	2.73	2.09	.64
3000–4000	3	2.08	1.44	.64
4000–5000	2	2.35	1.73	.62
5000–6000	..	...	...	..
6000–7000	1	1.96	1.34	.62
7000–8000	1	2.25	1.57	.68

Readiness-to-Serve Costs and Increased Size. The only class of costs remaining are those dependent upon the readiness of the company to serve the customers. These costs are largely the investment costs on the equipment necessary, which is constituted of three classes: sub-station equipment; distribution equipment, consisting of the wire and cable plant, pole lines, and conduit; and central office equipment. All of the maintenance and repairs, depreciation, and interest on this equipment with the exception of maintenance of central office equipment is considered as belonging in this class.

. . . Table 29 shows the trends of the different kinds of cost per subscriber with an increased size of the exchange. As is seen,

TABLE 29

Cost of Fixed Capital and Expenses per Telephone in Wisconsin Telephone Exchanges

Dec. 31, 1915

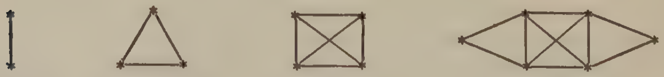
Class	Number of Exchanges	Cost of Fixed Capital per Telephone	Expenses per Telephone	Output Expenses per Telephone	Customer Expense per Telephone	Readiness-to-Serve Expenses per Telephone	Distribution Maintenance per Telephone	Sub-station Operation and Maintenance per Telephone	Depreciation per Telephone	Interest at 8 per Cent on Fixed Capital per Telephone
0–1000	141	$58.57	$17.20	$4.43	$2.41	$10.41	$1.38	$1.37	$3.01	$4.65
1000–2000	22	67.29	18.27	3.32	2.73	12.06	1.31	1.29	4.08	5.38
2000–3000	7	77.78	20.21	3.93	3.24	13.17	.96	1.47	4.52	6.22
3000–4000	3	74.50	19.89	4.09	2.12	13.68	.99	1.55	5.18	5.96
4000–5000	2	90.04	23.15	4.86	2.42	15.83	.99	1.41	6.23	7.20

. . . the readiness-to-serve costs are the ones which cause the total costs per telephone to rise with an increase in the number of subscribers, output and customer costs per station being practically constant. . . . Of the different elements in readiness-to-serve costs, interest and depreciation are the ones causing the increase in the costs per telephone with increased size. It is apparent, then, that it is the increased equipment necessary which causes the increase in cost per subscriber. An analysis of the equipment into the three kinds mentioned above should be the next step, but the data necessary to do this are not available for all of the Wisconsin telephone exchanges. It was necessary to restrict this study to the different exchanges of the Wisconsin Telephone Company, giving an even poorer sample than when all of the exchanges are used. This division is shown in Table 30. Considerable irregularity exists, but it is apparent that the increase in cost of the distribution system and of the central office equipment per telephone is largely responsible for the increase in total cost. . . . The increase of $22 in the total cost per station results from an increase of $10 in the distribution system cost and $12 in the cost of central office equipment.

The results obtained for the cost of subscribers' station equipment per telephone will probably not be questioned. There appears to be no reason why the cost of the telephone stations per subscriber should rise with an increased number of subscribers.

Likewise, there will probably be but little doubt that the trend of central office equipment per telephone to increase will be as shown. . . . It has been well recognized that the necessity for providing interconnection whenever a new subscriber was added between all of the old subscribers and the new one was responsible for a considerable part of the increased costs per subscriber. The use of the following diagrams is a tradition in explaining this fact.

Chart 40—Interconnection in the Telephone System.



TWO STATIONS ONE CONNECTION

3 STATIONS 3 CONNECTIONS

4 STATIONS 6 CONNECTIONS

SIX STATIONS TEN CONNECTIONS

Until five or six thousand subscribers are reached this condition of increasing cost per station occurs in the necessary increase in multiple facilities in the switchboard. After this number of subscribers is reached the chief source of increasing costs is in the trunking equipment.

The upward trend of the cost of the distribution system per subscriber is not so easily explained, and the results obtained are certainly not conclusive. It has frequently been said that the fact that lines become longer as the number of subscribers increases and the territory served becomes larger is one explanation of the increased cost per station of rendering telephone service. It must be remembered, however, that the density of the territory served, as well as the extent, ordinarily increases with an increased size of the exchange. This enables a more efficient utilization of pole lines, conduit, and cables which would be expected to more than offset the increased cost due to the greater distance of the subscribers from the central office.

TABLE 30

Cost of Fixed Capital per Telephone in Exchanges of the Wisconsin Telephone Company

Dec. 31, 1915

Class	Number of Exchanges	Cost of Fixed Capital per Telephone [a]	Distribution Equipment per Telephone	Substation Equipment per Telephone	Central Office Equipment per Telephone	Telephones per 100 Population
0–1000	55	$58.16	$42.11	$10.41	$ 5.64	$16.59
1000–2000	11	71.46	53.29	8.77	9.40	16.61
2000–3000	4	67.21	46.29	8.61	12.31	15.68
3000–4000	3	69.06	46.31	10.39	12.36	16.26
4000–5000	2	83.27	58.64	9.41	15.22	15.39
5000–6000	..	....	....	....	....	....
6000–7000	1	86.66	61.63	11.58	13.45	15.78
7000–8000	1	75.12	43.32	12.79	19.01	29.10

[a] Land and buildings were excluded as only part of the exchanges possessed such property.

The figures for the cost of the distribution system per telephone in Table 30 included both the cost of the connections between the subscribers and the central office, and the trunking equipment. If the cost of the trunking equipment were excluded, entirely different results might be found. The trunking equipment necessary per station would be expected to increase with an increased size, for a much greater portion of the calls must be trunked. This factor may account for the increased cost of the distribution system per subscriber shown in Chart 40.

Although the fact that the cost of telephone service per subscriber increases with an increased number of subscribers has been well recognized, few attempts have been made to show this quantitatively. Several comparisons of rates to the number of subscribers have been made, but the only study of the behavior of the cost of the plant with increased size was one made by C. A. Wright and W. B. Judd.[2] They found that the following formula expresses the normal relation between the two:

Plant value = 73.0 × the number of subscribers — $15,200.

Costs Per Possible Connection and Increased Size. This emphasis upon the relation between total cost and the number of subscribers may cause a forgetfulness of the true nature of the product of the telephone industry. To establish a condition of increasing cost per unit of product it must be shown that the cost per possible connection increases with increased output. Table 31 shows that this is not the case, rather the contrary condition being true. It may be the case that the value of the increased product of the larger exchanges decreases more rapidly after a certain size is reached than does the cost, value being evidenced by the number of calls per possible connection. The truth of this statement may be determined by comparing the rate of decrease in cost per possible connection with the rate of decrease in calls per possible connection. If calls decrease more rapidly than cost, the statement is probably true. In testing the truth of this possibility a weight should be applied to the calls of the larger exchanges to allow for the greater value of each call due to the greater proportion of business service.

TABLE 31

COSTS PER TELEPHONE AND PER POSSIBLE CONNECTION IN WISCONSIN TELEPHONE EXCHANGES

Dec. 31, 1915

CLASS	NUMBER OF EXCHANGES	COST OF FIXED CAPITAL		TOTAL EXPENSES	
		Per Telephone	Per Possible Connection	Per Telephone	Per Possible Connection
0–1000	141	$58.57	$0.1548	$17.20	$0.1284
1000–2000	22	67.29	.0516	18.27	.0142
2000–3000	7	77.78	.0317	20.21	.0081
3000–4000	3	74.50	.0232	19.89	.0061
4000–5000	2	90.04	.0208	23.15	.0053

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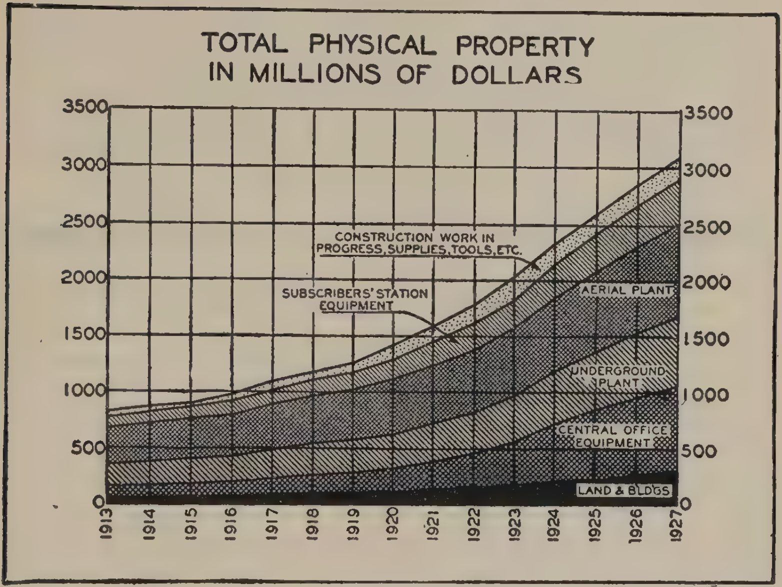
[2] *Telephone Plant Values*, Ohio State University Bulletin, Engineering Series, No. 32, 1925.

90. Telephone Property *

Chart 41



* American Telephone and Telegraph Company, *Annual Report to the Stockholders*, for year 1927, p. 27.

91. Telephone Operating Expenses *

Telephone operating expenses are composed of a very different set of items from those entering into compilations of wholesale commodity prices. This fact is brought out very clearly in the chart on this page, which shows a dollar of Bell System operating expenses split into its component parts on the basis of the experience of the year 1920. It is a characteristic of the telephone business that, on the average, out of every dollar expended for operating expenses, approximately 63 cents go for wages, 15 cents for materials, 7 cents for taxes, 3 cents for rents and 12 cents for miscellaneous minor expenses. Nearly twice as much is spent for wages as for all other items combined. Less than a sixth of the whole goes for materials. Taxes and rents together comprise one-tenth of the total operating cost of Bell telephone service. . . .

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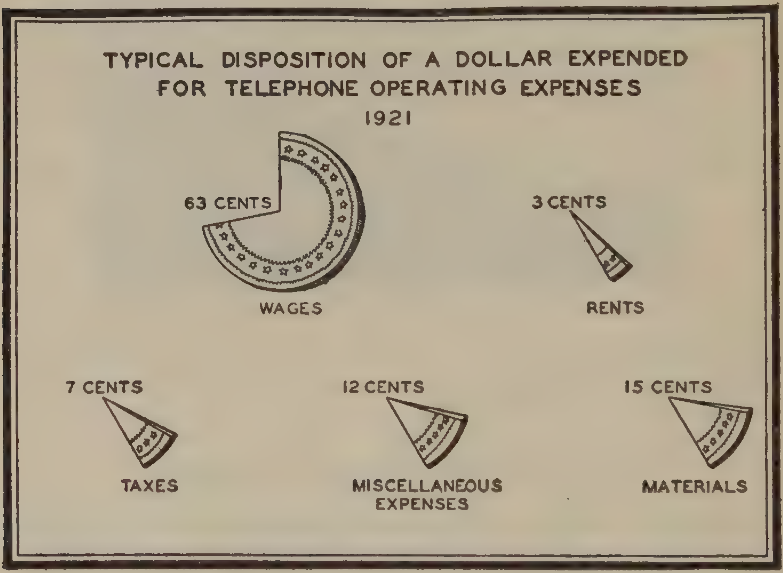
* S. L. Andrew, excerpt from *Price Movements and Telephone Costs*, pamphlet issued by American Telephone & Telegraph Company, Dec. 1, 1921.

Wages. The wages of telephone employees (which take, on an average, 63 cents out of every dollar of telephone operating expenses) have not been increased since 1914—the beginning of the war—to the same extent as were wages in many other industries; and therefore telephone wages cannot now be expected to fall as the higher wages in such other industries are falling. Figures compiled by Governmental agencies—the United States Bureau of Labor Statistics and the New York State Industrial Commission—show that the average wage earnings per employee in representative manufacturing industries increased between the end of 1915 and the autumn of 1920 by about 115 per cent. The average earnings of Bell Telephone employees, however, increased less than 80 per cent between the end of 1915 and the end of 1920. It is true that during recent months a gradual downward movement in the general level of industrial wages has been in evidence. Such wage reductions as have been made in skilled employments, however, have been largely confined to those occupations in which wage advances since the beginning of the war period had been greater than the average advance for wages in

Chart 42



TYPICAL DISPOSITION OF A DOLLAR EXPENDED FOR TELEPHONE OPERATING EXPENSES 1921 general, at times reaching 125 per cent, 150 per cent or even more, and have not similarly affected industries like the telephone business in which increases were made more conservatively. Moreover, in the cases where the pay of skilled industrial workers has been reduced, the reductions probably have averaged not more than 20 per cent and certainly less than 25 per cent; the larger cuts have been mostly in the wages of unskilled labor. But telephone employees, both men and women, are a highly trained and specialized group, not comparable to the ordinary classes of labor readily obtainable in the general labor market, and the proportion of unskilled labor is comparatively negligible. Moreover, the rapid advances in the art continuously call for more and more skill. During the war a very large number of skilled telephone men entered the Signal Corps and other technical branches of the army and navy; and there was no influx of new men into the telephone business such as occurred in industries stimulated by direct war demands. Whereas in many other lines, war-time expansion has resulted in a surplus both of plant and of skilled labor, in the telephone industry there is still a shortage of plant and, because of the steady growth of the business, there is a scarcity rather than a surplus of skilled telephone workers. Thus, as the wages of telephone employees were never increased to the same extent as were those of skilled workers in many industrial lines, they cannot now be expected to fall as the higher wages in such other industries are falling.

Materials. The cost of materials used in the maintenance of telephone properties constitutes only a minor element (about 15 cents in each dollar) of the total operating expenses of the telephone service; and therefore the decline which has taken place in the prices of some of these commodities, which is probably only temporary in character, cannot effect any substantial reduction in the total cost of providing telephone service. Reference to the chart showing the items of telephone operating expenses discloses the fact that only about 15 cents of each dollar of telephone costs go for materials. Any savings on materials through lower prices can therefore affect only this small proportion of the operating expenses. But industries in which extensive use is made of highly manufactured articles—such as the telephone industry—must continue to pay high prices for these articles, unless manufacturing wages are very much more sharply reduced than they have yet been or seem likely to be in the near future. Moreover, taxes enter into the cost of every commodity and through the cost of living into wages, and as long as taxation remains at or near its present high level it will exert a strong influence toward maintaining prices.

Furthermore, from the standpoint of both historical precedent and present economic conditions, it seems certain that the declines which have occurred in wholesale commodity prices are partly of a temporary character. Indeed, an outstanding feature of the economic developments of recent months has been the increasing evidences of strength in the general price level. This tendency toward rising price quotations is reflected in the various authoritative indices of average wholesale price movements. Bradstreet's price index, which is based upon a limited number of commodities that are chiefly raw materials, shows an increase of about 7 per cent during 1921 from June 1 to November 1. According to the price index compiled by the United States Bureau of Labor Statistics, which covers over three hundred commodities ranging from raw materials to fully manufactured products, average wholesale prices in October were 1.4 per cent above the average in July. Among the commodities exhibiting real price strength in recent months have been some of the most conspicuous of the materials used in the telephone industry, including copper, lead, rubber and textiles.

A survey of the general price situation * at the present time shows that prices of a considerable number of important commodities—many items of building material, for example—are still abnormally high with respect to the average price level; and declines in such commodities, some of which are used by telephone companies, are to be expected. On the other hand, however, there are numerous commodities, also including many materials used for telephone purposes, the prices of which are temporarily below the average price level,—which, in view of current wage levels, taxes, etc., generally means below the cost of production. In the case of such commodities, future price movements will, in all probability, be upward. As is indicated by authoritative compilations of price movements, the net result of varying fluctuations of this character during recent months has been an advance in the average price level, the tendency being for the number and extent of increases in price to more than offset the number and extent of decreases. . . .

On the average, to repeat, not over 15 cents out of each dollar of telephone operating expenses is spent for the purchase of ma-

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* Editor's Note: This article was written the latter part of 1921 when average commodity prices had shown a substantial decline from their post-war peak and when certain industrial wages had been somewhat reduced.

terials. Not only can a decline in the average price of all materials affect, at most, only this minor element of telephone costs, but recent developments indicate that the effect of commodity price movements is now tending toward increasing these expenses rather than toward decreasing them and that this tendency is likely to continue, though possibly not without temporary interruption.

Taxes. Taxes take about 7 cents of each dollar of telephone operating expenses, and present indications are for an increase, rather than a decrease, in taxes collected from telephone companies. The expenditures of the Bell Telephone System for direct taxes,—federal, state, county and municipal,—have been increasing steadily for many years, both in absolute figures and in relation to property, and since 1916 the rate of increase has been very rapid. Although the most marked advance has taken place in federal taxes, station and municipal taxation also has substantially increased of late years, and another marked increase in these taxes is reported in the present year. In regard to federal taxes, legislation recently enacted by Congress provides for a 25 per cent advance in the flat corporation income tax rate for 1922 and each calendar year thereafter, and accordingly the prospect of a decrease in the tax burden of telephone companies appears remote.

Rents and Miscellaneous Expenses. As to rents and miscellaneous expenses, which account for about 15 cents out of each dollar of operating expenses, rents in general are still at their highest level, and the costs of so many of the great number of items which enter into miscellaneous expenses have remained firm as to indicate that no very important saving has been, or can be, effected in these expenses. In the smaller towns and villages, the Bell telephone companies do not own all the buildings in which their offices are located and accordingly have to pay rent like other tenants; and payments of this character comprise a large proportion of that part of operating expenses which is classified as rent. It is a matter of common knowledge that, with rare exceptions, rents of buildings and building space have not been reduced.

Miscellaneous expenses include all the many things and services, not elsewhere classifiable, which an organization such as a telephone company requires, from the clean towels delivered daily by the towel supply companies in the large cities to the horse and wagon that the plant man hires when, in a remote district, his work temporarily takes him in a different direction from that pursued by his companions traveling in the big company-owned truck. So numerous and varied are these items that it is very difficult to determine whether or not prevailing influences point toward lower costs. However, since the cost of so many of the items is dependent upon general wage levels, and since other items appear to be little subject to reduction, there is as yet no hope of significant declines in these expenses as a whole.

Summary as to Telephone Operating Expenses. Consideration of the composition of telephone operating expenses, then, brings out the fact—surprising to most people—that the purchase of materials constitutes a relatively minor fraction of these expenses as compared with wage payments. Indeed, the wages of employees constitute such a predominant element of telephone operating costs that, if telephone wage levels are to be maintained at a level not inconsistent with other wages and conforming to the requirements of efficient service, it may be logically necessary and proper for telephone rates to be increased—regardless of movements in the average prices of commodities—in areas in which telephone revenues are not now adequate. Moreover, present economic and political trends indicate that, except for possible minor and probably temporary reactions, not only is the movement of average commodity prices upward rather than downward, but that the tax burden of telephone companies may also continue to increase for some time to come.

In the light of the peculiar factors affecting telephone operating expenses, the Wisconsin Railroad Commission, in a decision rendered on May 26, 1921, stated:

> The general readjustment in prices and wages which is now in progress will not, according to our best information, affect the operating expenses of telephone companies to any considerable extent. A large part of operating expenses consists of operators' wages which are in turn limited as to their minimum by the provisions of the Industrial Commission's order relating to the wages of women and minors employed in industry in the State of Wisconsin. Furthermore, the wages have not been on a level with wages paid in manufacturing and other industries during these past abnormal years; for that reason it is not reasonable to expect much of a decline in telephone wages for some time to come.

On June 30, 1921, the same Commission summed up the situation as to telephone operating expenses in a finding that while the expenses of a telephone company for the future might experience some decline from those for 1920, there was no ground for expecting any immediate material reduction.

92. Average Telephone Operating Expense

TABLE 32

AVERAGE TELEPHONE OPERATING EXPENSE PER 'PHONE FOR TELEPHONE COMPANIES *

1902–1922

	1902	1907	1912	1917	1922
Operating Expense [a]	$55,743,075	$115,404,115	$168,039,952	$255,970,903	$459,918,434
Number of 'Phones..........	2,315,297	5,552,929	7,326,748	9,953,710	12,295,234
Av. Expense per 'Phone......	24.07	20.78	22.93	25.72	37.41

[a] Includes depreciation and also miscellaneous operating expense which cannot be segregated for 1902-1917.

* Compiled from Bureau of Census—Census of Electrical Industries—Telephones 1902-1907 include mutual as well as commercial companies; 1912 and 1917 include only all companies with incomes of $5000 or more; 1922 includes only all companies with incomes of $10,000 or more.

93. Expenses of Telephone Companies

TABLE 33

CONDENSED ANALYSIS OF THE EXPENSES OF TELEPHONE COMPANIES

1902–1922 *

CLASS	1902 [a]		1907 [a]		1912 [b]		1917 [b]		1922 [c]	
	Amount $	Per Cent of Total	Amount $	Per Cent of Total	Amount $	Per Cent of Total	Amount $	Per Cent of Total	Amount $	Per Cent of Total
Gross Receipts [e]	86,383,276	100.0	183,230,799	100.0	253,893,969	100.0	372,501,800	100.0	656,823,908	100.0
Wages and Salaries	36,255,621	41.9	68,279,127	37.3	96,040,541	37.8	169,655,066	45.5	341,537,822	52.0
Salaries	9,885,886	11.4	19,298,423	10.5	32,681,482	12.9	46,566,869	12.5	94,006,233	14.3
Wages	26,369,735	30.5	48,980,704	26.8	63,359,059	24.9	123,088,197	33.0	247,531,589	37.7
Depreciation	....	....	....	....	40,755,657	16.1	63,312,657	17.0	93,970,731	14.3
Other Oper. Exp.[d]	19,487,454	22.6	47,124,988	25.7	31,243,754	12.3	23,003,180	6.2	24,409,881	3.7
All Oper. Exp.[d e f]	55,743,075	64.5	115,404,115	63.0	168,039,952	66.2	255,970,903	68.7	459,918,434	70.0
Interest	5,343,325	6.2	16,127,817	8.8	20,163,960	7.9	26,868,861	7.2	43,297,307	7.2
Taxes	2,944,281	3.4	6,368,731	3.5	12,411,516	4.9	24,149,087	6.5	46,798,880	7.2
Rentals [e]	691,830	.8	1,670,694	.9	1,611,922	.7	4,284,628	1.1	7,524,499	1.1
Other Deductions	....	....	....	....	340,294[h]	.1	1,829,581	.5	2,620,845	.4
Net Income	21,660,755	25.1	43,659,442	23.8	51,326,325	20.2	59,398,740	16.0	96,663,943	14.7
Dividends	14,982,719	17.3	23,733,670	12.9	34,120,809	13.4	42,266,589	11.3	66,035,251	10.0
Surplus	6,678,046	7.8	19,925,772	10.9	17,205,516	6.8	17,132,151	4.7	30,628,692	4.7

* Compiled from reports of the Bureau of Census, *Census of Electrical Industries—Telephones* 1922 and 1917.

The figures for 1902 and 1907 include mutual as well as commercial companies.

[b] The figures for 1912 and 1917 include only all companies reporting incomes of more than $5000.

[c] The figures for 1922 include only all companies reporting incomes of more than $10,000.

[d] Exclusive of "payments for telephone traffic made to other companies" to the amount of $1,187,265 in 1912, $1,230,948 in 1907, and $442,260 in 1902. This item is not reported for the years 1917 and 1922. For the purpose of a condensed statement the item "uncollectible revenues" is included in revenues. It appears again in other operating expenses and in all operating expenses.

[e] In the reports for 1917 and 1922 an item of rentals is listed which has been arrived at in accordance with the specifications of the Interstate Commerce Commission—Uniform Classification of Accounts for Telephone Companies. The item "rentals" includes all rentals with the following deductions: (1) All leases or rents for a period of less than one year are treated as operating expenses, and (2) that portion of the total rental which covers services, light, heat, etc., and maintenance and interest upon investment (estimated if not known) is charged to operating expenses. In lieu of any such item in the reports for 1902, 1907 and 1912 and in order to obtain a figure comparable to that of later years, the item "payment for use of leased lines," reported as a deduction from gross income, and the item "rental of conduits and underground privileges," reported as an operating expense, are treated as "rentals." The items "rentals of offices and other real estate" and "rentals of instruments and apparatus," which may most accurately be called operating expenses, are treated as such.

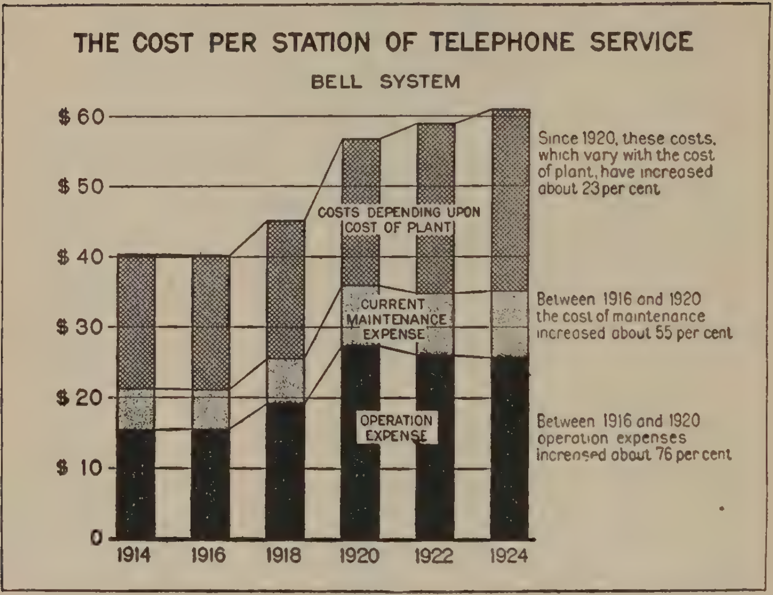
[f] An item of "non-operating expense" is reported for 1917 and 1922. This is treated as an operating expense since no segregation of such expense is made in the earlier years and if incurred it has been included in operating expense.

[g] Sinking fund charges reported as operating expenses but treated as deductions in lieu of any sums designated as "other deductions."

[h] Includes interest on debenture stock.

94. Operating Cost per Station *

Chart 43



95. Index of Utility Construction Costs †

The Factor of Labor Productivity

The street-railway industry faced a particularly difficult situation from 1914 to 1919. The five-cent fare seemed to be a fixture. Some relief was obtained in the way of fare increases in 1918, but in many cases—and this applied to the group of companies studied here—fare increases were not obtained until 1919. Rising material costs had to be met by the companies, but considerable resistance was offered to the payment of higher wages. This resistance came from necessity rather than from choice. In the meantime, other industries, unburdened with the control exercised by the slow-moving machinery of regulation, were expanding and offering attractive wages to laborers. Many of the

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* American Telephone and Telegraph Company, *Annual Report to Stockholders* for 1924, p. 6.

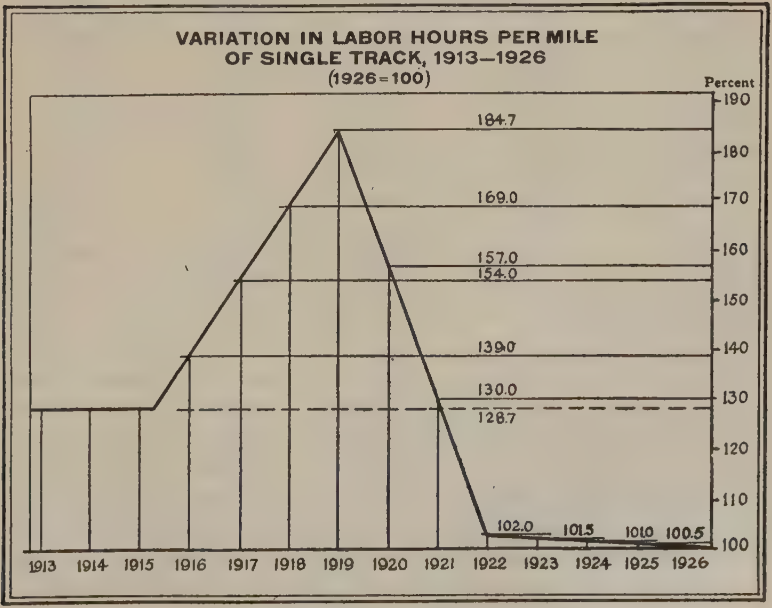
† Excerpt, Paul Jerome Raver, "Index Number of Public Utility Construction Costs," *The Journal of Land & Public Utility Economics*, III (Nov., 1927), 343-360.

workers left the companies to take work in industries paying higher wages and many others left to join the military forces. The supervisory personnel was likewise affected. The result of this situation was that the companies lost their trained track construction personnel and had to use the poorest grade of labor.

The result of the use of a continually changing force of "green" men was that labor costs mounted rapidly in spite of the maintenance of a low wage rate. The effect of this important factor on the index number of track construction costs is lost completely where the weight given to the labor item is constant throughout the period considered. This labor productivity factor is perhaps of more importance in the case of street-railway construction cost indexes than of those of any other industry. Attention will be given here to the use of labor-saving machinery as an element in this variable productivity factor.

In order to determine the variation in labor productivity, a heavy type of paved track construction was analyzed. This type of construction was typical for the group of companies studied. The variation in the number of labor hours required to build

Chart 44



one mile of single track of this type of construction from 1913 to 1926 is plotted on a percentage basis on Chart 44, using 1926 as 100 per cent. Since the index number is derived by multiplying hours of labor by the wage rates in each year, it does not matter what year of the series is taken as 100 per cent as far as the final result is concerned. In the year 1926 the productivity of track labor was found to be greater than that in any other year in the series, and it seemed logical to assign 100 per cent to the total hours of labor required for 1926. The final index number for each year will be the same no matter what year is taken as 100 per cent.

TABLE 34

CALCULATION OF LABOR PRODUCTIVITY ON BASIS OF CHART 44

(1926 = 100 PER CENT)

YEAR	MULTIPLIER (TABLE [a]) IN PERCENTAGE (2)	DEDUCT 100 PER CENT (3)	DIVIDE COLUMN 3 BY COLUMN 2, PERCENTAGE (4)	PERCENTAGE PRODUCTIVITY DEDUCT COLUMN 4, FROM 100 PER CENT (5)
1926	100.0	0.0	0.0	100.00
1925	100.5	0.5	0.497	99.503
1924	101.0	1.0	0.99	99.010
1923	101.5	1.5	1.477	98.523
1922	102.0	2.0	1.96	98.040
1921	128.0	28.0	21.875	78.125
1920	157.0	57.0	36.305	63.695
1919	184.72	84.72	45.864	54.136
1918	169.0	69.0	40.828	59.172
1917	154.0	54.0	35.064	64.936
1916	139.0	39.0	28.057	71.943
1915	130.0	30.0	23.076	76.924
1914	128.73	28.73	22.318	77.682
1913	128.73	28.73	22.318	77.682

[a] Refers to a Tabulation, p. 349 of the original article, not included in this excerpt. (Editor's note.)

The percentage variation shown on Chart 44, although based on one type of track construction only, is applied to each of the different types considered in determining the total number of labor hours of the same for each year from 1913 to 1926. Here, again, it should be evident that these quantities are not dependent on what year is taken as 100 per cent productivity. The only assumption made in this computation is that the variation in productive capacity was the same for every type of track on the system. Knowing the variation in this productive capacity for the principal type of construction, the multiplier shown on Chart 44 was applied to the total labor hours required to build all the track of the sample in 1926, and for each of the preceding years back to 1913 (Chart 44). From the multiplier shown in Chart 44, we are able to compute the labor productivity in percentages, using 1926 as 100 per cent, as already explained. These computations are shown in Table 34 and plotted on Chart 45 together with the average wage rate for a construction gang in cents per hour.

Multiplying the total labor hours for each year as shown in Chart 44, by the average rate per hour for that year gives the total labor cost of straight track construction by years from 1913 to 1926. The results of these computations give the relation between labor cost, labor wages, and labor productivity, as plotted on Chart 46. The curve of labor cost per mile of single track is shown as a resultant of the two factors of wages and productive capacity.

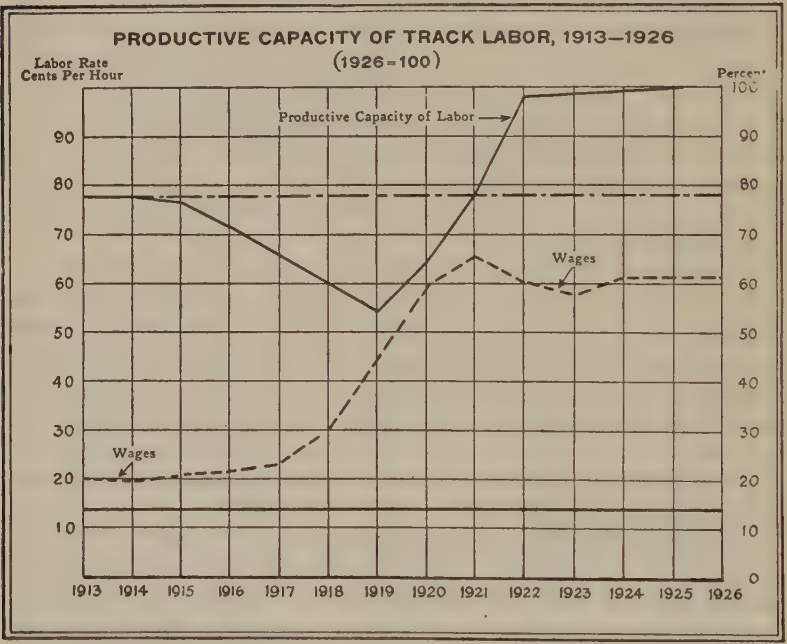
It will be noted from Chart 46 that the curve of labor cost per mile of single track began its downward trend in 1920 in spite of increasing wage rates. This followed the increase of labor productivity which began about 1919. Labor productivity was restored to the 1913 level by 1921. The decline in the labor cost curve continued sharply until 1922. At this time there was a marked slackening of the rate of increase in labor productivity, yet in 1926 the productivity was approximately 22 per cent greater than it was in 1913.

The above analysis, when supplemented by a study of the use of power-tool equipment, leads to the conclusion that at least two elements enter into this factor of labor productivity—namely, labor efficiency and the development of the use of labor-saving machinery. Although it is impossible to assign a precise increment of value to each of these elements, we are warranted in arriving at a fairly definite conclusion as to which of the two is the greater.

A study of the use of power-tool equipment in the group of companies considered here reveals that few changes were made in this equipment during the period from 1913 to 1920. The diminishing productivity of labor during these years, as shown on Chart 45, can therefore be attributed entirely to declining labor efficiency brought about by the decreasing purchasing power of wages and the general demoralization incident to the World War.

By the end of 1919, however, fare increases had made possible rather marked increases in wages, and by 1920 the real wages of the track laborers were higher than they were in 1913. Then it was once more possible to organize and maintain a trained track construction personnel. This situation is shown on Chart 45 by a marked increase in labor productivity following 1919. The change from the 10-hour to the 8-hour day undoubtedly contributed to this increase, partly because of the element of fatigue but principally because work on heavy traffic streets was avoided during the early morning and evening rush hours. However, it is reasonable to assume that the actual increase in efficiency of labor itself reached its maximum shortly after the time that the wages of labor caught up with the cost of living, namely about 1920, for at this point labor turnover decreased to a minimum and a year-round track construction force was again established. It is not a mere coincidence that the productivity of labor was restored to the 1913 level shortly after this point. In other words, as soon as the disrupting influences of the war were removed and wages

Chart 45



rose to a point where they equaled or exceeded the level in 1913, the stability and efficiency which existed in 1913 were restored and any further increases in labor productivity must be attributed to some other factor, or factors, than that of labor efficiency.

The other factor of importance to which we can attribute the increase in labor productivity from 1921 to date is the increased use of labor-saving machinery. The factor is assignable to efficiency in management. An analysis of the purchases of new and additional power tools since 1920 tends to verify this conclusion. In one class of small power tools alone the valuation in 1926 was 278 per cent of the valuation in 1922. The value of all power tools and equipment increased approximately 200 per cent in the last four years.

What this means in savings in labor costs is illustrated by Chart 46. In 1921, wages and labor costs were both approximately 225 per cent higher than they were in 1913. In 1926 wages were 206 per cent higher than in 1913 and labor costs were only 138 per cent higher than in 1913. It seems reasonable to assume that a large part of this spread between labor costs and wages in the last five years is directly assignable to the increased use of power-tool machines and is the justification for their use.

We say ‘‘a large part’’ only of this spread is due to the use of power-tool machinery because other factors also contributed to the increased productivity. If increasing purchasing power of the laborer’s income provides incentive for greater effort on the part of the laborer, then credit must be given him in some degree; for while productivity was increasing from 1921 to 1926, real wages were also rising during this period in spite of a decline in wage rates. Furthermore, some consideration must be given to the fact that the higher real wages during this period may have resulted in securing more efficient laborers, although this factor was probably fairly well discounted by 1921, when the 1913 level of real wages was again reached. At least, no perceptible change in the class of labor has been noted by the writer in the construction forces of this particular group of companies since that date. The further increase in real wages from this point on, if this premise is correct, resulted in what might be called a laborer’s surplus and did not inspire any perceptible increased effort on his part.

The decreasing purchasing power of the laborer’s wage, prior to 1919, was not entirely the cause of the decreasing efficiency, but was rather the cause of the disruption of the organization, and this disruption resulted in lowered efficiency because of the poorer grade of labor employed. Similarly, the increased efficiency since 1919 indicates a stabilization of the labor force on a higher plane rather than increased efficiency of the laborer as such. Inasmuch as the period of readjustment may be said to have extended from 1919 to 1921 (Chart 45), the conclusion is drawn that the standards of labor economy had returned to the 1913 level by 1921.

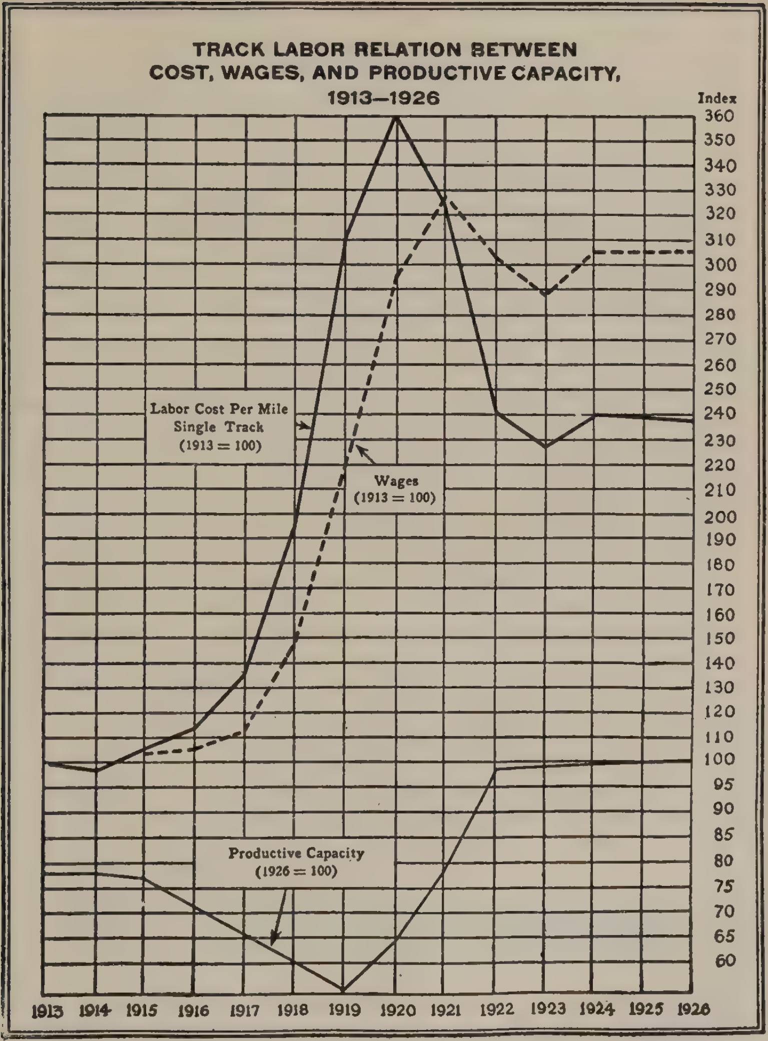
Although this comparison with pre-war standards of labor efficiency seems justified, it must be understood that the use of 1913 as a base does not imply 100 per cent labor economy in 1913 any more than the use of 1926 as the base year for 100 per cent productivity implies that no further increases in labor productivity may be expected in the future. As a matter of fact, if labor efficiency is in any way related to real wages, it is clear that 1913 was not a year of 100 per cent labor economy as compared with, say 1907, for the purchasing power of wages as measured by the cost of living declined from 1907 to 1913.

Some consideration must also be given to the fact that training and experience in the use of power tools result in increased labor efficiency. Whether such progress may be imputed to the machinery or credited to the laborer is a debatable question. In any event, the improvement in the laborer's efficiency due to training and experience probably does not extend over a very long period of time. Six months would be a liberal estimate of the time required to develop maximum efficiency in the comparatively simple tasks assigned to a track laborer. Nevertheless, all these factors influencing greater efficiency were fairly well discounted by 1921 so that the principal factor from 1921 to 1926 was the increased use of labor-saving machinery.

On Chart 47 is shown the index number of track construction costs (labor and material) of the group of companies studied from 1913 to 1926. Curve 1 represents actual costs; that is, due consideration is given to the factor of labor productivity. Curve 2 represents actual costs as far as material is concerned, but labor is weighted as 100 per cent efficient throughout the period from 1913 to 1926; in other words, the factor of labor productivity is ignored. The spread between Curves 1 and 2 on Chart 47 from 1913 to 1921 reflects the increased cost of track construction due to increased labor efficiency. The spread between Curves 1 and 2 from 1921 to 1926 reflects the savings in cost resulting largely from the increased use of power tools.

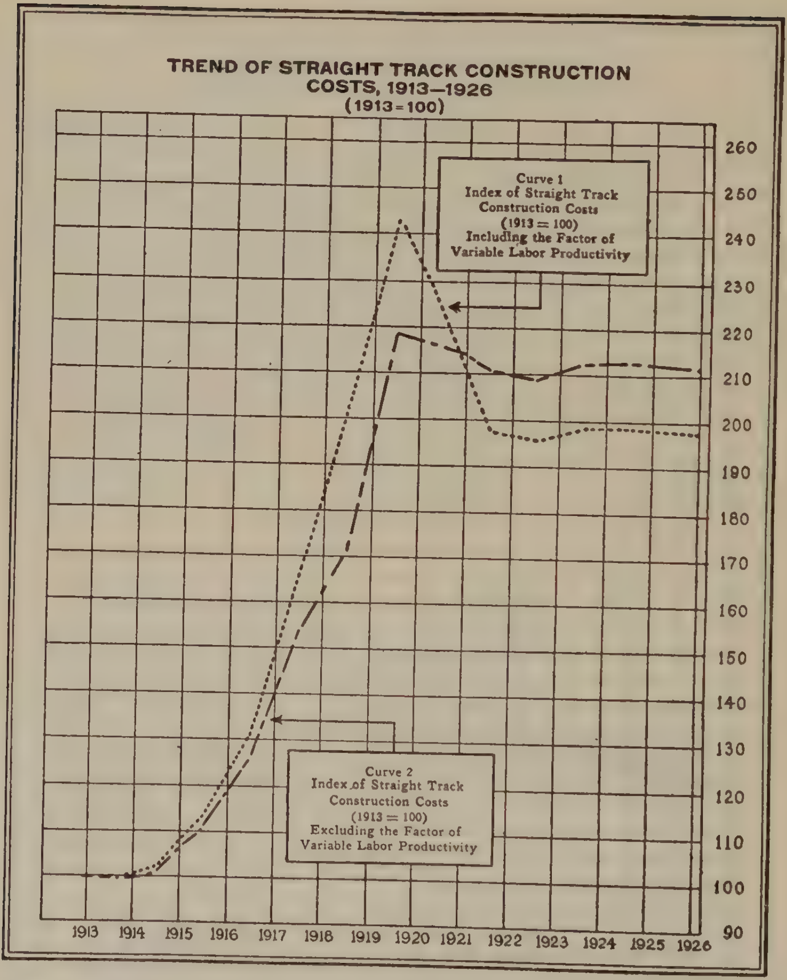
Since the courts and commissions have in general refused to allow valuations on the basis of reproduction cost at the peak

Chart 46



period of 1920 on the grounds of unreasonableness, it is unfair to penalize the companies during the period from 1921 to 1926 for the efficiency of management which has resulted in a lower reproduction cost during this period than would have resulted under a labor productivity equivalent to that which existed in

Chart 47



1913. The amount of this penalty from 1921 to 1926 is approximately equivalent to the area between Curves 1 and 2 on Chart 47.

The cost of labor in the total track structure and the index number of track labor are given in Table 35. The quantities are total labor hours times average labor rate expressed in millions of dollars. In one case labor productivity is considered as a constant throughout the period and in the other case it is considered as a variable. By combining the money cost of track materials in each year with the money cost of labor (Table 35), the properly weighted total cost of straight track construction for each year is obtained (Table 36). This is the final, composite index number of straight track construction costs. Here, again, a separation is made between the index numbers on account of variable labor productivity.

The application of the principles laid down in the preceding sections to the balance of the street railway property is necessary before the management may be sure that a revaluation of its properties is advisable. By applying the same methods of analysis to the remaining principal parts of the property, a composite index number may be constructed which will reflect accurately from year to year the trend of the total cost of the combination of labor and materials which constitutes the entire property and plant. For purposes of valuation, the data must be of such a nature that they can be submitted to, and stand up under, the critical examination of courts and commissions. For such a purpose, there are many cases where an index of construction costs can be developed for a particular company and applied to an already existing valuation with as much accuracy and much less expenditure of time and money than are required for a revaluation.

It should be clear that such an index number will not apply accurately to all other street-railway properties and certainly not to other public utilities such as gas, electric light, and telephone properties. Not only are there differences in the construction cost indexes of different types of public utilities, but there are rather wide differences in the indexes developed by different authorities for the same type of utility. In Table 37 the composite indexes of construction costs for the physical property of typical utilities are presented.

In the Indianapolis Water Company case, decided November 22, 1926, the Supreme Court based its decision favoring the "spot" reproduction cost theory largely on the idea that a new plateau of stabilized prices had been reached. These prices, the Court felt, were likely to continue for a reasonable period in the future. Examination of Table 37 indicates that, taking the utility group as a whole, a state of normalcy in construction costs, or anything resembling it, does not exist.[1] We may assume that the wide divergence in the indexes of different types of utilities is caused, in part at least, by economic differences inherent in each type. The electric light and power industry, for example, is distinctive in this respect because of the marked savings in unit production costs possible with expansion in the industry. These savings are reflected in construction costs. No such savings are possible in the water properties or street-railway utilities. The proportionate use of raw materials and finished products also bears on the relative construction costs of different utilities. This difference is marked in the street-railway and telephone industries where increasing labor productivity in the use of raw materials affects the former and greater labor efficiency in the factory affects the latter. Moreover, development in the art of cable construction has had an important bearing upon the lowering of construction costs in the telephone industry. These are inherent differences among the several utilities; we may expect, therefore, that dispersion in the levels of their construction cost indexes will continue to exist.

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[1] These differences in index numbers from 1913 to 1926 are not actual differences, since some dispersion existed in 1913. They represent additional differences. It is also necessary to eliminate that dispersion which is purely

On the other hand, certain price influences may tend to narrow the existing dispersion. The first of these is a possible decrease in the building construction activity of the country. The lowering of prices for construction materials, which would follow such a depression, would affect greatly the users of raw materials, namely, water, gas, and street-railway utilities. A second influence is the possible increase in the price of copper. Such an increase would tend to raise the construction costs of electric light, power, and telephone utilities. These two influences, if concurrently applied, would bring the construction cost indexes closer together.

a function of increasing size. This may be done by determining the ratio by which each index number increases or decreases as related to some base, such as the simple average of all the indexes. The actual additional deviations over such deviations as may have existed between the indexes of the several utilities in 1913 will then be expressed as ratios of each index number to the average index number. Such a computation has been made and reveals that the maximum dispersion, 40.5 points, occurred in 1917 instead of 1920, as indicated in Table 37. It also shows that the dispersion in 1924 was nearly as great as in 1917, namely 35.6 points.

TABLE 35

COST OF LABOR IN THE TOTAL TRACK STRUCTURE AND THE INDEX NUMBER OF LABOR COST, 1913 = 100

(1926 = 100 per cent productivity)

	1913	1914	1915	1916	1917	1918	1919
Cost of labor (millions of dollars)[a]	7.517	7.329	7.768	7.893	8.456	11.150	16.349
Index number of labor cost	100.0	97.5	103.0	105.0	112.5	148.3	217.5
Cost of labor (millions of dollars)[b]	9.677	9.435	10.098	10.971	13.023	18.844	30.200
Index number of labor cost	100.0	97.5	104.4	113.4	134.6	194.7	312.1

	1920	1921	1922	1923	1924	1925	1926
Cost of labor (millions of dollars)[a]	22.175	24.618	22.739	21.611	22.927	22.927	22.927
Index number of labor cost	295.	327.5	302.5	287.5	305.0	305.0	305.0
Cost of labor (millions of dollars)[b]	34.815	31.511	23.194	21.135	23.156	23.041	22.927
Index number of labor cost	359.8	325.6	239.7	226.7	239.3	238.1	236.9

[a] Labor productivity taken as a constant.
[b] Labor productivity taken as a variable.

TABLE 36

Cost of Labor and Material in the Total Track Structure and the Composite Index Number of Straight Track Construction Costs

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Cost of labor and material (millions of dollars)[a]	30.394	30.340	30.700	33.733	38.221	46.574	52.117	66.162	65.373	63.863	63.328	64.422	64.510	64.142
Index number of labor and materials..........	100.0	99.8	101.0	111.0	125.7	153.2	171.5	217.7	215.1	210.1	208.3	211.9	212.2	211.0
Cost of labor and material (millions of dollars)[b]	32.554	32.446	33.030	36.811	42.788	54.268	65.698	78.802	72.266	64.318	63.652	64.651	64.624	64.142
Index number of labor and materials..........	100.0	99.7	101.4	113.1	131.4	166.7	202.7	242.1	222.0	197.6	195.5	198.6	198.5	197.0

[a] Labor productivity taken as a constant.

[b] Labor productivity taken as a variable.

TABLE 37

Comparison of Various Public Utility Construction Cost Indexes

Year	Electric Railway			Inter-urban R.R.	Electric Light and Power Companies		Telephone Companies	Artificial Gas Companies		Water Companies
1913	100.[a]	100 [b]	100.[c]	100	100	100[b]	100	100	100 [b]	100
1914	94.0	98	99.7	100	99	98	96	97	98	95
1915	97.3	106	101.4	103	102	105	101	100	103	99
1916	119.8	132	113.1	126	117	130	114	132	126	129
1917	162.7	168	131.4	158	146	156	135	182	184	197
1918	192.5	199	166.7	183	166	182	149	193	221	213
1919	205.1	209	202.7	192	187	195	166	199	228	212
1920	244.7	230	242.1	229	216	207	192	243	256	271
1921	200.7	191	222.0	204	186	179	184	210	200	220
1922	175.2	184	197.6	178	166	181	171	183	190	197
1923	200.2	199	195.5	207	177	190	177	216	209	234
1924	204.6	202	198.6	220	180	191	170	230	213	243
1925	202.4	. . .	198.5	222	178	. . .	167	230	. . .	233
1926	202.6	. . .	197.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .

[a] *Electric Railway Journal,* LXIX (Jan. 1, 1927), p. 29 (developed by Albert Richey from American Electric Railway Association statistics).

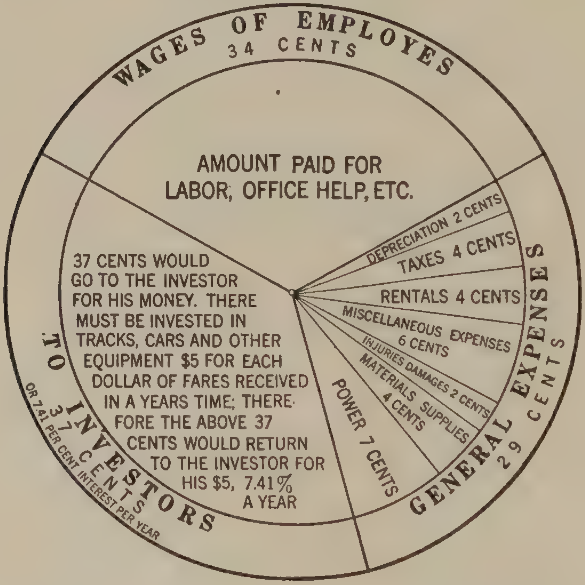
[b] L. R. Nash, *Economics of Public Utilities,* p. 158.

[c] Index number developed in this paper, limited to straight track construction costs in a particular group of companies.

96. The Electric Railway Dollar *

Chart 48

How Experts Say a Dollar in Fares Would Be Divided by an Average Prosperous and Growing Company Able to Give Good Service and Paying All Necessary Wages and Expenses.



97. Distribution of Bus Operating Expenses in 1926 †

Chart 49 shows that the average distribution of bus operating expenses for 80 bus undertakings of electric railways in 1926 was as follows:

	Per Cent
Maintenance of Plant and Equipment	37.7
Transportation	32.4
Operating Garage Expense	20.5
Administrative and General Expense	9.4
Total	100.0

Wages constituted the largest percentage of any single item, being 27.1 per cent. Maintenance of buses amounted to 13.8 per cent and fuel was 12.8 per cent of the total bus operating expense.

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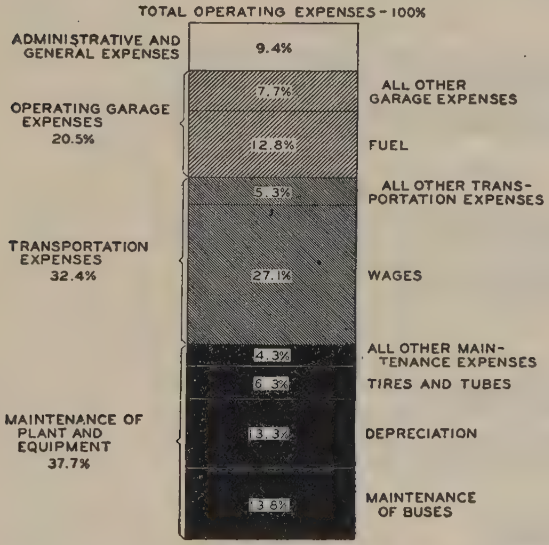
* *Bulletin* of Illinois Committee on Public Utility Information.

† From "Recent Trends in the Electric Railway Industry," A. E. R. A. *Bulletin No. 168* (Nov. 1, 1927), 33-35.

Chart 50 is a comparison of the maintenance, depreciation and operating costs (excluding overhead) of the bus operations of 80 electric railway bus undertakings in 1926 and 1925. For the purpose of comparison the 1925 figures are taken to equal 100 per cent. The particular 80 bus undertakings (used in the preceding chart also) were chosen because their reports furnished complete and comparable data on operating expenses for two full years.

Chart 49

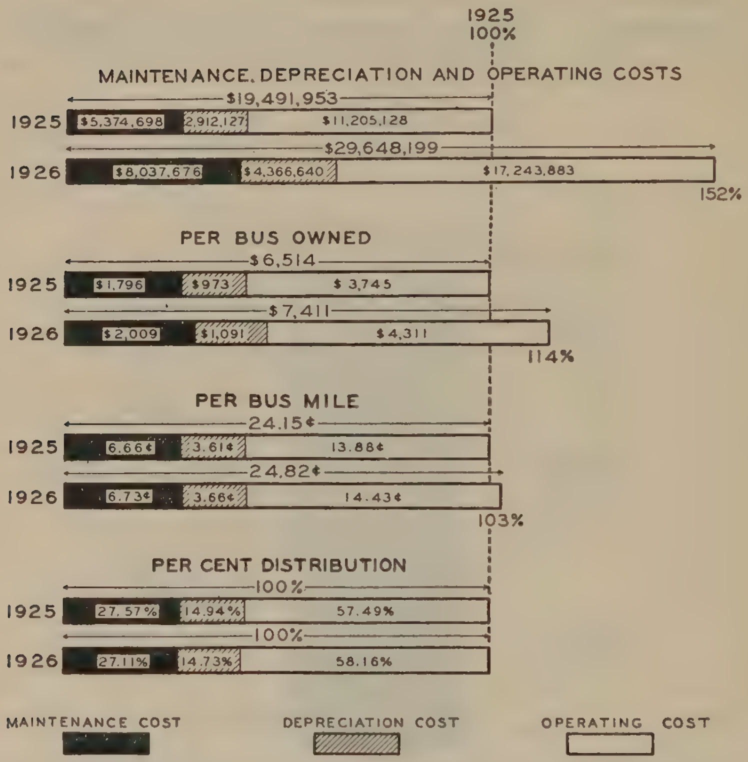
AVERAGE OF 80 BUS UNDERTAKINGS



It will be seen on this chart that maintenance, depreciation and operating costs for this group of companies increased 52 per cent in 1926 over 1925. On a basis of the number of buses owned this expense was 14 per cent higher in 1926 than in 1925 while on a basis of bus miles operated it was 3 per cent higher in 1926 than in 1925. There was very little alteration in the relative percentage distribution of these three items between the two years compared.

Chart 50

80 BUS UNDERTAKINGS



98. Comparative Costs of Steam Electric and Hydro-Electric Establishments *

White Coal. Conservation of natural resources. Cheap electricity. Such simple and alluring phrases have built up so powerful a popular illusion of the advantages of hydro-electric development that water power has become a leading issue of the Presidential campaign. Ex-Governor Smith, in fact, is so convinced of the importance of developing our water resources that he is advocating government ownership and government operation of generating plants.

* Sherwin C. Badger, "White Coal Buncombe," *Barron's Weekly*, VIII (Oct. 22, 1928), 3, 8.

Opposing the glib arguments of hydro-electric propagandists are facts and arguments too-little appreciated and too-seldom stressed. First of all is the question of conservation, by which is meant the harnessing of natural resources now being allowed to run to waste, and, to a lesser degree, the saving of limited resources such as coal and oil by substituting therefor water power. This theoretically sound argument must, in our present competitive economic society, be answered by two practical questions: Can an appreciable part of our water-power resources manufacture electricity more cheaply than coal, oil or gas? If not, is the public prepared to pay a higher price for electricity in order to conserve coal and oil for the benefit of future generations? Limitations of human altruism answer the second question in the negative, and, therefore, as a practical proposition, the feasibility of any hydro-electric project must be determined by costs.

The chief cost of producing electricity by water power is capital. With a very few exceptions, notably Niagara Falls, streams must be dammed for hydro-electric purposes, either to store water during dry seasons to ensure continuous operation of the plants, or to create an artificial fall of water. Thus, to produce hydro-electric energy it is usually necessary to build not only a power house but also a dam, frequently supplemented by expensive water tunnels; and to buy the land that will be flooded by the dam.

Probably a fair average cost for developing water-power sites, exclusive of those few like Niagara Falls created by nature, is $200 per kilowatt of capacity, while often the figure runs as high as $300. Assuming money for the venture is raised at 7 per cent (a "fair" rate of return, according to a host of court decisions), that the property is depreciated at the rate of 2 per cent annually, and that taxes, miscellaneous charges, like insurance, etc., come to 1½ per cent annually, it can be seen that primary overhead will amount to 10½ per cent annually on the capital invested. If the plant cost $200 per kilowatt capacity, the primary overhead will be $21 per kilowatt per year, while if the investment is $250 per kilowatt, the primary overhead will be $26.75 per kilowatt annually.

With these figures as a base, it is now possible to estimate the primary cost of generation per kilowatt-hour under varying conditions. These conditions are largely dependent upon the "load factor," that is the percentage of capacity at which the plant is run throughout the year. If the plant were run at 100 per cent capacity, each kilowatt of installed power would generate 8760 kilowatt-hours a year, whereas if it were run at 50 per cent capacity, the output would be only 4380 kilowatt-hours a year. The figures follow:

TABLE 38

Load Factor in Relation to Overhead

Load Factor Per Cent	Annual Output in Kilowatt-hours	Overhead per Kilowatt-hour	
		$200 Investment	$250 Investment
40	3,500	$0.0060	$0.0076
50	4,380	0.0048	0.0061
60	5,250	0.0040	0.0051
70	6,130	0.0034	0.0044
80	7,000	0.0030	0.0038

The above costs represent well over 90 per cent of the expense of generating electricity by water power. They correspond roughly to the cost of equipment plus fuel in a steam-generated plant. Before discussing the controversial charges included above or how they might be reduced under government ownership and operation, let us compare the costs to those of a modern steam plant.

Average cost of erecting a good-sized modern steam plant runs between $100 and $125 per kilowatt capacity, or about half the investment of a hydro plant. Using a figure of $115 per kilowatt capacity (which is almost exactly equal to the cost of several recently completed plants), and assuming that cost of capital and taxes are the same as with a hydro plant (7 per cent plus 1½ per cent), and figuring depreciation at 4 per cent (or 2 per cent higher than in a hydro plant), the primary overhead on the steam-plant investment per kilowatt-hour would vary as follows:

Load Factor Per Cent	Overhead per Kilowatt-hour
40	$0.0041
50	0.0033
60	0.0027
70	0.0023
80	0.0021

Comparing the above figures of capital overhead with those of the hydro plants, it will be seen that there are margins in favor of steam plants varying under specific general conditions to the following extent:

TABLE 39

COMPARISON OF STEAM AND HYDRO PLANT INVESTMENTS

LOAD FACTOR PER CENT	STEAM LESS THAN HYDRO INVESTMENT $200 PER KW. CAP.	HYDRO PER KILOWATT-HOUR HYDRO INVESTMENT $250 PER KW. CAP.
40	$0.0019	$0.0035
50	0.0015	0.0028
60	0.0013	0.0024
70	0.0011	0.0021
80	0.0009	0.0017

The differences cited in favor of steam projects represent the approximate amount steam plants can afford to pay for fuel per kilowatt-hour produced in order not to exceed hydro plants in operating costs. The price of coal varies, of course, according to quality and distance from the mines. A good eastern coal contains 14,000 B.t.u. of heat per pound. Assuming this figure and that coal is burned in a modern station using 1200 pounds steam pressure, and that it takes 13,000 B.t.u. of heat to produce one kilowatt-hour of electricity, then fuel expense per kilowatt-hour of electricity produced will vary as follows:

PRICE OF COAL PER TON	COST PER KILOWATT-HOUR
$2.00	$0.0009
3.00	0.0014
4.00	0.0019
5.00	0.0023
6.00	0.0028

To take a specific example, a steam plant running at 60 per cent load factor and paying $4 a ton for coal, will have a primary overhead of $0.0046 per kilowatt-hour produced ($0.0027 capital overhead plus $0.0019 for coal). A hydro plant running on the same load factor would have a primary overhead of $0.0040 per kilowatt-hour if the plan represented an investment of $200 per kilowatt capacity, and an overhead of $0.0051 per kilowatt-hour if the investment were $250 per kilowatt capacity.

Using this method of calculation, it is possible to draw up a rough table showing the approximate maximum price a steam plant can afford to pay for coal in order to produce power as cheaply as hydro plants:

TABLE 40

Load Factor	Maximum Price for Coal per Ton	
	Hydro Investment $200 per Kw. Cap.	Hydro Investment $250 per Kw. Cap.
40	$4	$6 plus
50	$3 plus	$6
60	$3 minus	$5 plus
70	$2 plus	$4 plus
80	$2	$3 plus

These figures broadly indicate three things: overhead costs of good-sized steam and hydro plants are remarkably close; for base-load service steam-plants are decidedly cheaper when there is a low load factor; steam plants are approximately as cheap regardless of load factor conditions wherever cheap coal is available.

It will be observed that actual operating costs exclusive of coal, such as labor, repairs, supplies, etc., have been omitted from the above calculations. A good-sized modern steam plant spends not much over one mill per kilowatt-hour on such costs when operating at a 40 per cent load factor, while at a 70 per cent load, the expense is reduced to roughly three-quarters of a mill. A hydro plant's corresponding expenses should not run above one-quarter of these figures. However, this difference in favor of hydros is normally more than counterbalanced by differences in cost of transmitting power. A water-power project must locate wherever power is available, regardless of distance from markets, whereas a steam plant can locate (with certain limitations) almost anywhere. In general, therefore, hydro power must be transmitted farther to reach its market than steam-generated power. High-tension transmission lines cost from $10,000 to $30,000 a mile, so that interest costs on this additional investment (disregarding energy losses in transmission) very quickly eat up the lower incidental operating costs of hydro plants.

Under private ownership, therefore, it is apparent that even low-cost hydro developments produce electricity little or no more cheaply than the most modern steam plants, while expensive hydro plants produce "firm power" less cheaply. (Such extraordinary water sites as Niagara Falls do not fall within either of the above categories.) How could government operation and ownership, even through a "power authority," a politically created corporation, such as advocated by Ex-Governor Smith, reduce the cost of hydro generation?

The first assumed saving under government ownership would be in interest and through elimination of profits for private stockholders. Ex-Governor Smith believes his "power authority" could raise all the money required through bonds bearing 4 per cent. Assuming for the moment this questionable statement (Port of New York Authority bonds are currently selling to yield over 4 per cent), then a government corporation could save 3 per cent in interest annually, which would amount to $6 per kilowatt capacity per year on a project costing $200 per kilowatt. This amounts to 1.7 mills per kilowatt-hour if the plant is run on a 40 per cent load, and to only 0.85 mill if the plant is run at 80 per cent capacity. These savings, amounting to 81 cents and 36 cents respectively on the average customer's yearly bill, are predicated on the assumption that a government corporation would build plants as cheaply and efficiently as a private profit-making organization, would not be swayed by politics in selecting sites, would allow no graft in purchasing land sites, would show no favoritism in the granting of contracts, etc.

It is also assumed by government-ownership advocates that a government corporation could operate more cheaply because it would pay no taxes, either on property or securities. The fallacy of this argument is self-evident, for if the government did not collect taxes from the power development and its stockholders it would have to collect the taxes elsewhere, so that in the end there would result merely a shifting of tax burdens from the electric customer to the general public, which, by the way, is the electric consumer.

Up to this point nothing has been said of important economic trends in electric production that indicate during the next several years the cost of producing electricity by steam will fall considerably below present levels. Higher and higher steam pressures are being used in turbine generators, with resulting increased efficiency. In the West and Middle West an important new fuel is being used at low cost, namely, natural gas, due to the discoveries of tremendous gas deposits.

More important, however, are the improvements in coal-combustion methods and equipment that have grown out of engineering studies in the past ten years. Ten years ago furnaces were fed by hand, ashes were a serious problem, coal was incompletely burned and it required 17,500 B.t.u. of heat to generate one kilowatt-hour of electricity, and of this heat some 80 per cent went into the condensing water, up the flue, or was otherwise lost. Today powdered coal is blown into furnaces, ashes are removed automatically, combustion is almost complete, and it requires but 13,000 B.t.u. of heat to produce one kilowatt-hour and only 74 per cent of that heat is lost.

Startling as these improvements are, steam generation is today only some 26 per cent efficient. Engineers are already predicting combustion refinements that should make this figure approach 40 per cent, while some are even hinting at 50 per cent efficiency in the more distant future. Contrast the room for improving steam efficiency with the high efficiency (approximately 90 per cent) already developed in hydro generation. Yet steam generation even in its present inefficiency is running hydro generation a nip-and-tuck race as to costs.

Engineering and chemistry are rapidly developing a process which bids fair to revolutionize the whole art of central station combustion and may reduce fuel costs as much as 50 per cent. This is the so-called low-temperature carbonization of coal, by which powdered coal is run through a heated kiln and converted into a semi-coke and into various coal by-products. One ton of coal so treated will produce 0.738 ton of semi-coke, which burns faster, more completely and at a higher temperature than coal. There are also produced 28 gallons of coal tar, 2½ gallons of motor fuel, 2,800,000 B.t.u. of gas.

Under present conditions and with current prices for by-products, it is estimated a ton of $4.50 coal will produce products valued at $6.92, thus leaving $2.42 per ton of coal to cover the cost of the process. This figure does slightly better than cover costs, but until the process is improved further, it can be said the margin is too small for commercial use.

Looking farther ahead, however, the outlook is decidedly interesting. Coal tar, the chief by-product derivative of the process, has many important uses. The outstanding tar-distillate market is for wood-preserving creosote. This market is expanding rapidly and now approaches 200,000,000 gallons annually. The next most important coal-tar derivative is phenols. Use for phenol products, such as phenolformaldehyde resins like "Bakelite," are constantly broadening, and with the development of cheap formaldehyde from water or natural gas, promise to increase even more. In other words, there is every likelihood that chemical discoveries of uses for coal-tar derivatives will increase demand for them, and consequently increase prices. Assuming coal tar rises to 8½ cents a gallon, as against 5½ cents now, it has been estimated a ton of coke can be produced for $4.50 a ton coal at a net cost of $2.45 a ton, thus nearly halving the central stations' fuel bills.

Summarizing, then, the facts and figures of modern electric generation show the popular idea that hydro-electric development necessarily means cheap electricity is a fallacy. They show that steam will now produce electric energy approximately as cheaply as water power in most industrial sections of the United States. The progress of efficient combustion methods has made cheap steam production possible, and continued combustion progress indicates still cheaper steam production for the future. Finally, discoveries such as low-temperature coal carbonization open up a vast field for further development which may result in reducing fuel costs to insignificant figures.

Aside from the comparisons of cost of generation from either coal or hydro power, it should be pointed out that the expenses of producing electric energy at power plants represent only from 10 per cent to 15 per cent of the final cost of power to the ultimate consumer. If this primary cost were entirely eliminated, electric rates would drop only slightly, roughly about $2 or $3 a year on the average customer's bill. If the government should undertake electric production through a nation-wide development of water-power sites, the best that could be hoped for would be a reduction of less than 10 cents a month on the average residential consumer's bill.

99. Power Costs in Large Plants*

Facts instead of opinions should prevail in power-station design. The difference between $140 and $80 per kilovolt-ampere as the cost of similar stations cannot be explained wholly because of differences in local conditions, load factor, or fuel cost. Nor do generating costs ranging from 0.65 cent per kilowatt-hour to 1.2 cents per kilowatt-hour at the busbars differ so greatly because of fuel prices or load factors. When some stations use four times the number of employees that another does per unit of capacity there is room for economic justification of this difference in labor charges, especially when thermal efficiencies are about the same and operating conditions are similar. Large

* L. W. W. Morrow, *Electrical World*, XCII (Oct. 27, 1928), 827-831.

TABLE

SUMMARY OF COST DATA ON

STATION	A	B
Approximate rating, kva	100,000+	50,000—
Number of generators	3	1
Number of boilers	15	6
Type of service	Transmission	Distribution
Fuel used	Oil and gas	Oil and gas
Fuel equipment	....	....
Steam pressure	375	375
Steam temperature	725	700
Operating Data		
Period covered	One year	One year
Total kilowatt-hours generated	250,000,000	175,000,000
Net kilowatt-hours generated	242,000,000	168,000,000
Average B.t.u. in fuel	Gas 1,100 Oil 19,000	Gas 1,100 Oil 18,900
Number of men engaged (all shifts)	160	66
Operating Costs (cents per kwh)		
Fuel	0.205	0.224
Wages and supplies	0.115	0.077
Water, lubricants, supplies	0.010	....
Miscellaneous	0.002	0.041
Maintenance Costs (cents per kwh)	0.332	0.342
Total (cents per kwh)		
Buildings	0.003	0.005
Boiler plant	0.023	0.026
Prime movers and auxiliaries	0.022	0.009
General and electric equipment	Incl. above	Incl. above
Miscellaneous	0.001	....
Total (cents per kwh)	0.049	0.040
Investment Costs (dollars)		
Preparing site	75,000	65,000
Foundations, substructure	1,700,000	125,000
Superstructure	2,200,000	1,000,000
Fuel handling and preparation	200,000	80,000
Boilers and accessories	3,500,000	900,000
Piping	1,100,000	200,000
Generators and condensers	3,200,000	1,200,000
Electric equipment in switchhouse	1,300,000	250,000
General Data		
Million b.t.u. used	14,200	2,700
Fuel cost per million B.t.u. (dollars)	35	136
Load factor	18	53
Use factor	20	53
B.t.u. per net kilowatt-hour	58,700	16,400
B.t.u. per gross kilowatt-hour	55,600	15,800
Thermal efficiency (net basis)	4.4	15.5
Unit Costs		
Total station cost, dollars per kva	100	128
Building cost, dollars per kva	27	25
Equipment cost, dollars per kva	71	71
Total fixed charge (15 per cent basis) (cents per kwh)	0.89	0.366
Total production charges (cents per kwh)	0.38	0.382
Total cost per kwh (cents)	1.27	0.748
Cubic Feet per Kilovolt-Ampere		
Coal preparation and handling	....	....
Boiler room	30	30
Turbine room	14	10
Switchhouse	7.5	27
Men per 1,000 kva. per day	1.6	1.4

41

REPRESENTATIVE POWER STATIONS

C	D	E	F	G	H
100,000—	100,000—	100,000+	100,000+	100,000—	250,000+
2	2	2	3	2	4
9	8	12	6	8	16
Distribution	Transmission	Distribution	Transmission	Transmission	Distribution
Coal	Coal	Coal	Coal	Coal	Coal
Pulver.	Stokers	Stokers	Pulver.	Stokers	Stokers
400	600	400	350	600	325
700	725	680	675	725	690
6 mo., 1 unit	One year	One year	One year	One year	One year
80,000,000	416,000,000	717,000,000	454,000,000	298,000,000	715,000,000
75,000,000	393,000,000	686,000,000	425,000,000	279,000,000	678,000,000
13,800	11,300	13,800	12,300	10,600	13,300
70	184	142	139	162	352
0.241	0.156	0.258	0.142	0.271	0.325
0.076	0.056	0.031	0.039	0.076	0.086
0.005	0.011	0.003	0.007	0.016	0.012
0.007	0.001	....	....	0.003	....
0.329	0.224	0.292	0.188	0.366	0.423
0.009	0.008	0.004	0.007	0.005	0.008
0.025	0.033	0.009	0.025	0.041	0.027
0.002	0.006	0.002	0.004	0.006	0.009
0.001	0.002	0.001	0.008	0.001	0.010
0.001	0.002	0.002	0.000	0.003	0.001
0.038	0.051	0.018	0.034	0.056	0.055
....	....	....	230,000	....	4,000,000
....	1,300,000	900,000	1,700,000	1,400,000	Incl. above
....	2,000,000	1,300,000	1,100,000	2,000,000	10,300,000
....	1,700,000	200,000	700,000	1,100,000	Incl. above
....	2,400,000	2,100,000	2,500,000	2,600,000	20,000,000
....	500,000	1,400,000	400,000	500,000	Incl. above
....	2,100,000	1,700,000	2,700,000	2,000,000	Incl. above
	Incl. above	1,800,000	1,200,000	Incl. above	Incl. above
1,180	5,820	9,500	6,700	4,200	11,560
154	142	186	90.50	171	191
51	....	72	56	43	40
41	....	58	43	39	30
15,600	14,780	13,820	15,750	15,180	17,000
14,900	14,000	13,200	14,750	14,200	16,150
16.3	17.25	18.45	16.2	16.8	14.9
85	142	144	132	130	127
....	39	56	21	38	52
....	101	59	71	90	71
0.146	0.476	0.442	0.424	0.592	0.436
0.366	0.275	0.310	0.227	0.421	0.478
0.512	0.751	0.752	0.651	1.013	0.914
5	....	2.2	7	....	....
14	31	50	23	31	31
11	19	35	17	18	17
3	1.25	14	6	1.25	14
0.7	1.8	1.4	1.4	1.6	1.4

TABLE

SUMMARY OF COST DATA ON

STATION	I	J
Approximate rating, kva	200,000+	300,000+
Number of generators	5	5
Number of boilers	19	11
Type of service	Distribution	Transmission
Fuel used	Coal	Coal
Fuel equipment	Pulver.	Pulver.
Steam pressure	300	375
Steam temperature	700	690
Operating Data		
Period covered	One year	One year
Total kilowatt-hours generated	653,000,000	929,000,000
Net kilowatt-hours generated	618,000,000	841,000,000
Average B.t.u. in fuel	11,300	13,100
Number of men engaged (all shifts)	225	245
Operating Costs (cents per kwh)		
Fuel	0.224	0.229
Wages and supplies	0.041	0.044
Water, lubricants, supplies	0.005	0.014
Miscellaneous	0.037	....
Total (cents per kwh)	0.307	0.287
Maintenance Costs (cents per kwh)		
Buildings	0.0032	0.005
Boiler plant	0.0241	0.023
Prime movers and auxiliaries	0.0060	0.001
General and electric equipment	0.0032	Incl. above
Miscellaneous	....	0.003
Total (cents per kwh)	0.0365	0.032
Investment Costs (Dollars)		
Preparing site	....	1,100,000
Foundations, substructure	....	1,200,000
Superstructure	....	5,300,000
Fuel handling and preparation	....	1,200,000
Boilers and accessories	....	4,800,000
Piping	....	2,700,000
Generators and condensers	....	5,200,000
Electric equipment in switchhouse	....	1,000,000
General Data		
Million B.t.u. used	10,320	13,200
Fuel cost per million B.t.u. (dollars)	134	154
Load factor	46	53
Use factor	36	34
B.t.u. per net kilowatt-hour	16,700	15,700
B.t.u. per gross kilowatt-hour	15,800	14,200
Thermal efficiency (net basis)	15.2	16.22
Unit Costs		
Total station cost, dollars per kva	121	81
Building cost, dollars per kva	....	21
Equipment cost, dollars per kva	....	55
Total fixed charge (15 per cent basis) (cents per kwh)	0.613	0.431
Total production charges (cents per kwh)	0.343	0.319
Total cost per kwh (cents)	0.956	0.750
Cubic Feet per Kilovolt-Ampere		
Coal preparation and handling	5	6
Boiler room	21	20
Turbine room	11	4.5
Switchhouse	6	....
Men per 1,000 kva. per day	1.1	0.81

41—*Continued*

REPRESENTATIVE POWER STATIONS—*Continued*

K	L	M	N	O	P
100,000+	50,000—	50,000—	100,000—	50,000+	100,000—
2	1	2	2	2	3
8	2	6	6	4	8
Transmission Coal Pulver.	Transmission Coal Pulver.	Transmission Coal Stoker-pulv.	Transmission Coal Pulver.	Transmission Coal Pulver.	Transmission Coal Stokers
600	400	300	350	350	300
720	700	600	690	650	700
One year	One year	One year	One year	One year	One year
481,000,000	120,000,000	158,000,000	286,000,000	116,000,000	191,000,000
452,000,000	114,000,000	153,000,000	267,000,000	110,000,000	182,000,000
13,800	7,600	11,300	13,700	9,750	13,700
48	76	27	63	69	98
0.143	0.24	0.299	0.251	0.214	0.418
0.041	0.09	0.069	0.060	0.112	0.062
0.007	....	0.003	Incl. above	0.015	0.006
....	....	0.008	Incl. above	....	0.003
0.191	0.33	0.379	0.311	0.341	0.4899
0.001	....	0.006	0.005	0.005	0.006
0.012	0.02	0.028	0.016	0.006	0.02
0.004	....	0.001	0.003	0.002	0.02
0.003	....	0.001	0.001	0.005	0.008
0.005	....	0.002	0.001	0.0165	0.006
0.025	0.02	0.038	0.026	0.0345	0.060
80,000	250,000	....	15,000	40,000	30,000
2,100,000	Incl. above	....	550,000	200,000	800,000
2,200,000	600,000	....	900,000	90,000	1,700,000
700,000	400,000	....	400,000	230,000	500,000
2,100,000	600,000	....	800,000	450,000	2,000,000
700,000	300,000	....	400,000	200,000	800,000
2,000,000	800,000	....	1,600,000	1,100,000	2,100,000
1,200,000	Incl. above	....	300,000	200,000	500,000
6,500	2,100	3,170	4,450	2,170	3,600
96	127	....	151	108	212
55	51	47	44	50	40
54	48	41	44	24	26
14,400	19,100	20,700	16,600	19,900	19,850
13,500	18,000	20,000	15,500	18,800	18,800
17.7	13.3	12.25	15.3	12.8	12.85
115	106.50	....	81	110	112
43	26	....	19	22	30
70	63	....	46	53	80
0.458	0.576	....	0.341	0.52	0.768
0.216	0.35	0.417	0.337	0.37	0.546
0.674	0.926	....	0.678	0.89	1.314
6	10	....	5.5	4	....
33	21	15	20	20	16
15	23	8	17	17	15
6	....	4	6	6	6
0.5	1.5	0.6	0.6	1.4	1.0

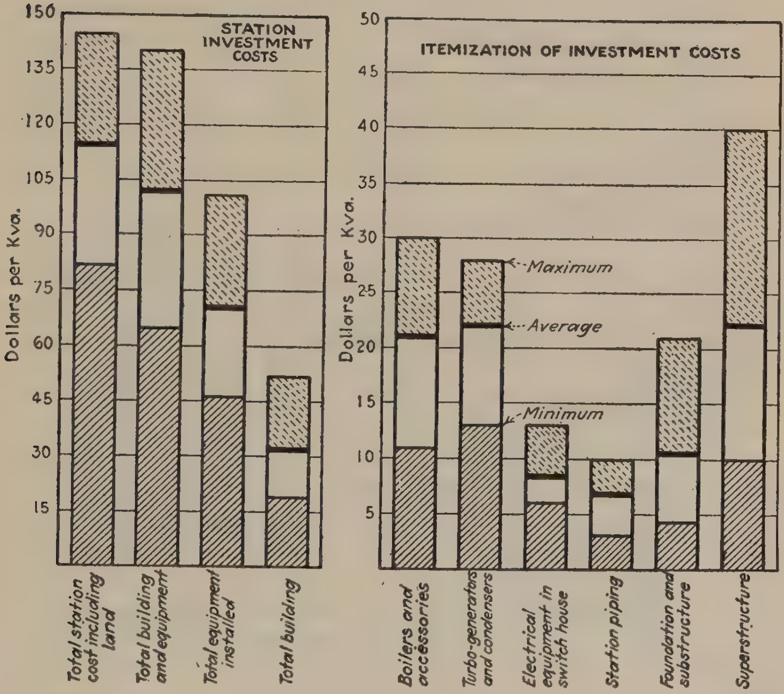
differences in these items are to be expected, but very wide ranges lead to questions.

A pioneering group of engineers have built several new power stations since the war. They have improved the economic and thermal performance of plants very materially and the trends they started bid fair to bring about still greater economies. But some mistakes were made and it is advisable to study the investment costs and the operating costs of these plants in order to build better and more economical stations in the future. For this reason *The Electrical World* has collected data on a representative group of modern steam stations. These plants are located in several parts of the country, operate under different conditions and embody different design ideas. Data on these plants are not comparable, but the range of values and unit values on items unaffected by local station conditions afford yardsticks for measurement and give valuable guides and checks for future station designs. With a yearly increment of 2,000,000 kva. in station capacity added to utility systems there is involved a plus or minus sum of about $120,000,000 per year that can be lost or saved depending upon station design specifications. The data given in Table 42 show station costs ranging from $81 to $140 per kilovolt-ampere. This is less than a two to one range in costs, and the costs of equipment in these stations, which should be somewhat comparable, range from $46 to $101 per kilovolt-ampere. This wide range in equipment cost cannot be explained entirely by differences in local conditions. Real estate, buildings, foundations, etc., are eliminated and the equipment is of a similar type as regards steam conditions and has very nearly the same rating. Nor can the current argument that high equipment cost has been justified to get high thermal efficiency in stations with high load factors and expensive fuel be accepted on the data shown. These stations were all built since 1924 and represent average rather than extremes in station design.

Local investment cost variables are real estate, site preparation, foundation, labor and, in large measure, the switchhouse. But in general, aside from labor costs, it is valid to make comparisons of the cost of the equipment installed in a station and the cost of the station building. These two items are the major cost items in most stations. Table 42 shows the range of values and the average values of investment costs for the completed stations and the divisions of the station as summarized from Table 41.

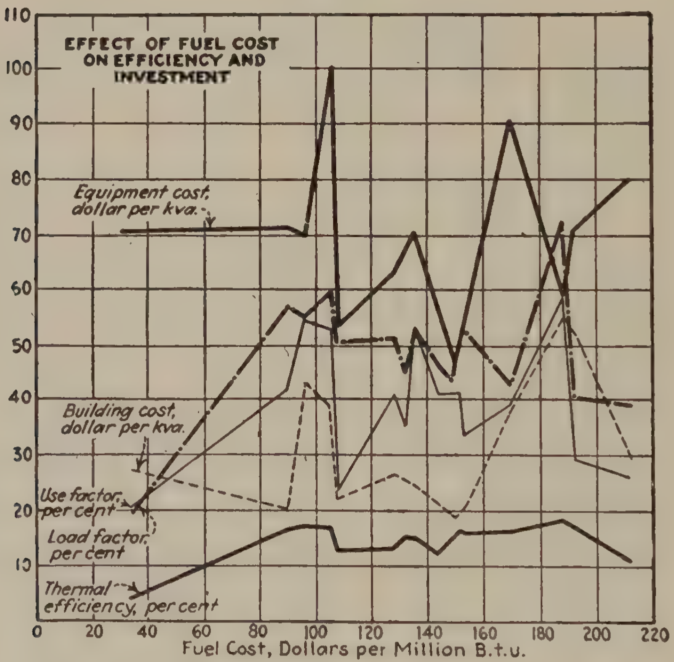
It happens that the highest total station cost applies to the plant that has the highest load factor and fuel cost, but the cost of equipment in this station is about the average per unit and its thermal efficiency is only average. In the group of stations that operate with load factors between 38 and 60 and with fuel costs between \$90 and \$170 per million B.t.u. it will be noted that there is little justification for saying that station investment has been based on thermal efficiency, load factor or cost of fuel. The range of cost is too great to be explained except by the application of different ideas to station designs.

Chart 51



In Table 42 some very interesting data are summarized. The total cost of completed stations, including all items of land, preparing site, overhead, etc., ranges from \$144 maximum to \$81 minimum per kilovolt-ampere. The total building cost, including both substructure and superstructure, ranges from \$52 to \$19. Breaking this total building cost into two parts, *i.e.*, superstructure, and foundation and substructure, it will be noticed that there is a 5.2:1 range in the cost of substructure and a 4:1 range in the cost of superstructure, both ranges greatly in excess of the range found in total building costs. Of this group of costs, aside from labor charges, those of the superstructure should be comparable, yet there is a 4:1 range in unit costs. This difference gives rise to speculation as to reasons for the differences and a study of unit station volumes in Table 43 gives an indication of one important variable that may be responsible for the cost range.

Chart 52



The total equipment cost shown in Table 42 includes all apparatus and the subdivided equipment costs include the larger groups only. Here again in the total and in the items there is a range of more than two to one in unit costs. These differences should not be so large, even though local modifying factors can be found. The equipment in a station has one primary object, and that is to get a reliable supply of energy at a minimum total cost to the station and to the utility system. Weighed in

TABLE 42

UNIT INVESTMENT COSTS IN DOLLARS PER KILOVOLT-AMPERE

	MAXIMUM	MINIMUM	AVERAGE	RANGE
Total station cost, including land....	144	81	114	1.7:1
Total building and equipment	140	65	102	2.3:1
Total building cost................	52	19	32	2.7:1
Foundations and substructure cost	21	4	10.6	5.2:1
Superstructure cost	40	10	22	4:1
Total equipment cost..............	101	46	70	2.2:1
Boilers and accessories...........	30	11	21	2.7:1
Station piping	10	3	7	3.3:1
Turbo-generators and condensers..	28	13	22	2.1:1
Electrical equipment in switch house	13	6	8.5	2.1:1

this balance a two to one range in unit cost values is entirely too great.

For the average station $12 is the cost of real estate and preparing the site, but the range of costs is very wide. Local variables influence foundations and substructure costs, yet a study of Table 42 shows a range for turbo-generators, boilers and accessories and station piping that is about as wide as that for those elements affected so largely by local conditions. These costs are completely installed costs with all overhead applied, and it will be noted that an average building cost of $32 and equipment cost of $70 add to give a total station cost of $102 that does not include cost of real estate or cost of preparing the site. Yet on a minimum basis these costs would be $19, $46 and $65 respectively, although no single station of Table 41 meets this minimum cost specification. The average cost values and the wide range in values lead to some interesting speculations

TABLE 43

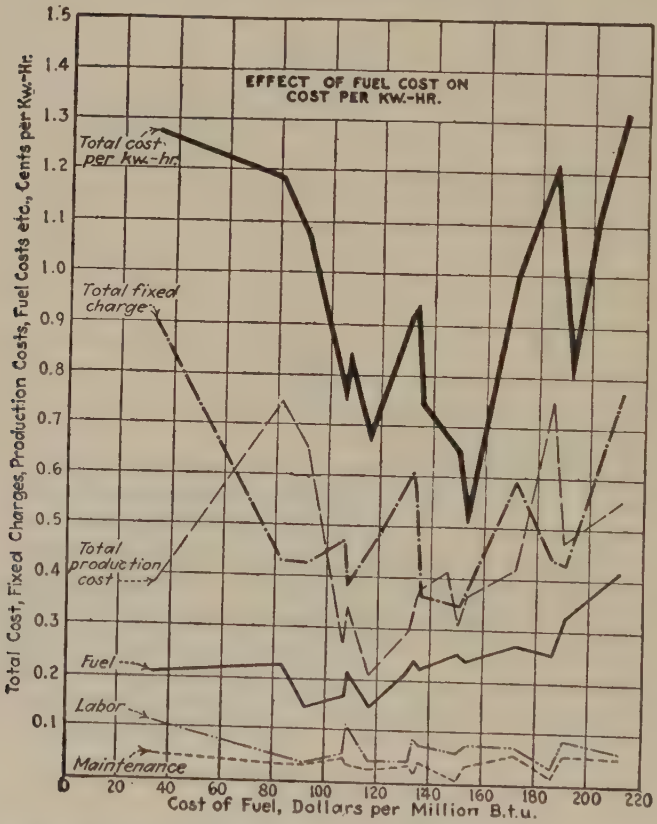
UNIT VOLUMES IN POWER STATION

(Cubic Feet per Kilovolt-Ampere)

	MAXIMUM	MINIMUM	AVERAGE	RANGE
Coal preparation and handling......	10	2.2	6	4.5:1
Boiler Room	50	14	21	3.5:1
Turbine Room	35	4.5	15	7.8:1
Switch House	27	0.6	6	45:1

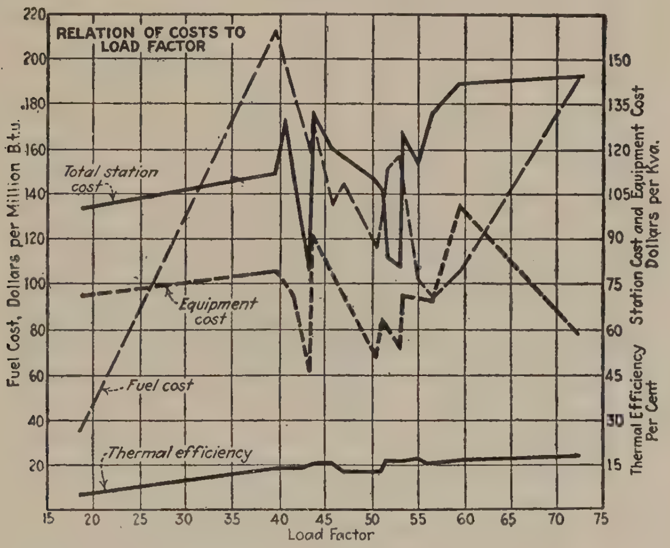
as to possibilities for building a station to meet the low cost values. Assuming minimums and $12 for real estate and site preparation a unit completed plant cost of $77 is a goal not yet reached, but which apparently is possible under special conditions. Total station costs of actual stations of $85 and $81 show that this minimum value has been approached very satisfactorily in two plants. The economic size of station from an investment cost point of view cannot be determined from the data, but in general the larger station has the greatest possibilities for cost reduction except where the station becomes very large. Then piping, control, fuel movement and other space factors become large and introduce increment cost increases per unit of capacity.

Chart 53



Unit volume values in Table 43 help to interpret the investment cost values given in Table 42. A large range is to be expected in coal preparation and handling and in the switchhouse because the plants burn coal, oil, gas and use stokers or pulverizers and serve both distribution and transmission systems. But all have about the same rated boilers and turbines, and yet the range of unit volume for the boiler room is 3.5:1 and for the turbine rooms is 7.8:1. Space is a great operating asset, but these ranges seem to indicate that some plants are too spacious and others too restricted in volume; at least the range is too great to be supported by intelligent designers.

Chart 54

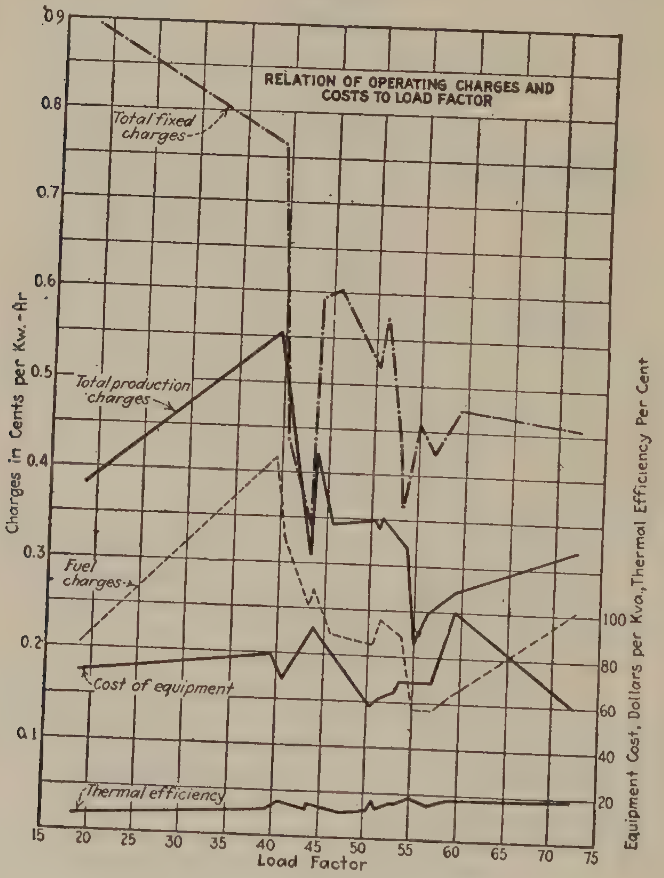


Another item of interest as regards investment is the use of automatic equipment to reduce labor charges and improve station economy. Increased fixed charges might well be justified if other charges were reduced. The following data give the number of men per day per 1000 kilovolt-ampere of station capacity.

	Maximum	Minimum	Average
Number of men................	1.8	0.5	1.2

It might be thought that large boiler and generator units would tend to lower labor requirements and that a study of thermal efficiencies would also show that correlation with labor charges, but the data fail to bring out any conclusions. The design of some stations introduces many complexities that require extra labor for station operation and the effect of labor prices,

Chart 55



of fuel prices and of the skill of the available labor modify conclusions. But the data show that reduced labor per unit of station capacity is a design desideratum and a design possibility.

The average total production cost in the group of stations studied is 0.36 cent per kilowatt-hour, made up of 0.322 cent for operation and 0.038 cent for maintenance. But the range of production costs as shown in Table 44 is from 0.545 to 0.207

TABLE 44

UNIT PRODUCTION COSTS IN CENTS PER KILOWATT-HOUR

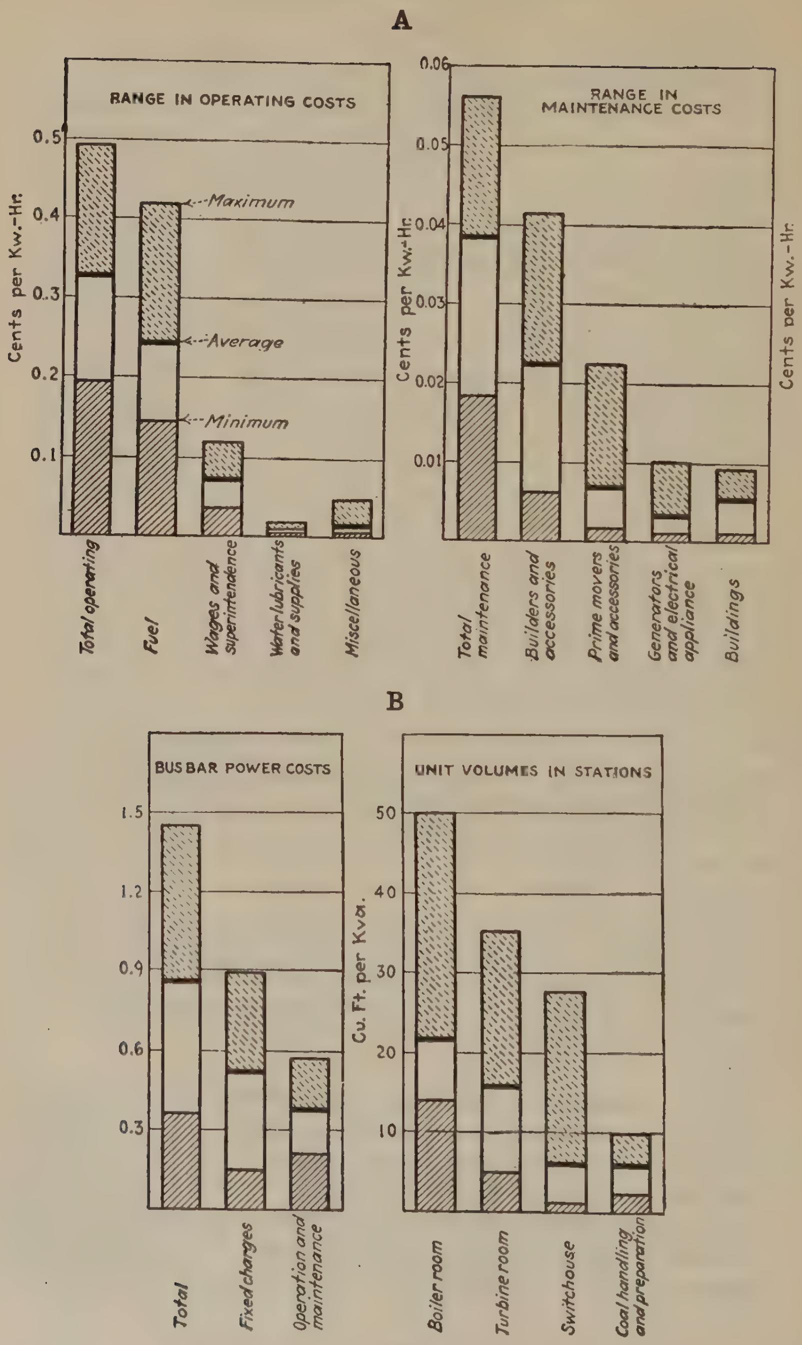
	MAXIMUM	MINIMUM	AVERAGE	RANGE
Operating cost, total	0.489	0.189	0.322	2.6:1
Fuel	0.418	0.142	0.240	2.0:1
Wages and superintendence	0.115	0.031	0.067	3.7:1
Water, lubricants and supplies	0.016	0.003	0.009	5.3:1
Miscellaneous	0.041	0.001	0.012	4.1:1
Maintenance cost, total	0.056	0.018	0.038	3.1:1
Buildings	0.009	0.0007	0.0052	1.3:1
Boilers and accessories	0.041	0.006	0.022	6.8:1
Prime movers and accessories	0.022	0.001	0.0062	2.2:1
Generators and electrical equipment	0.01	0.001	0.0034	10:1
Production cost, total	0.545	0.207	0.36	2.7:1
Fixed charge, total	0.895	0.146	0.50	6:1
Total cost of power	1.44	0.353	0.86	4:1

cent, or nearly three to one, and this range is about the same in the operation and maintenance subdivisions of the total cost. These ranges are remarkable when compared to a fuel cost range of 3:1 because a very great variation is to be expected in fuel costs. In boilers and accessories and in generators and electrical equipment the maintenance range is 7:1 and 10:1 respectively and a wide range is to be expected, but, comparatively, it is worthy of note that the variation in maintenance of electrical equipment is greater than that of the boilers, although the magnitude of the cost is about eight times less. In fact, the boiler maintenance averages twice as much as the sum of all other maintenance charges.

The total operating cost averages 0.322 cent, of which 0.24 is a fuel charge. Fuel cost is about three times that of all other operating charges. A nearly four to one range exists in the cost of water, lubricants and supplies. The wide range of these costs is rather remarkable when compared with the range in fuel costs.

Using a minimum of operating and maintenance charges, it will be seen that the goal to shoot at is 0.207 cent per kilowatt-hour and that the minimum total generating cost is 0.353. This figure was not approached closely by any station, nor was the sum of the maximum values. On an average basis the total cost of power at the generating station busbars is 0.86 cent. This value may well be taken as about the minimum in American

Chart 56


A
RANGE IN OPERATING COSTS
Cents per Kw.-Hr.
0.5
0.4
0.3
0.2
0.1
Maximum
Average
Minimum
Total operating
Fuel
Wages and superintendence
Water lubricants and supplies
Miscellaneous
RANGE IN MAINTENANCE COSTS
Cents per Kw.-Hr.
0.06
0.05
0.04
0.03
0.02
0.01
Cents per Kw.-Hr.
Total maintenance
Builders and accessories
Prime movers and accessories
Generators and electrical appliance
Buildings
B
BUS BAR POWER COSTS
1.5
1.2
0.9
0.6
0.3
Total
Fixed charges
Operation and maintenance
UNIT VOLUMES IN STATIONS
Cu. Ft. per Kva.
50
40
30
20
10
Boiler room
Turbine room
Switchhouse
Coal handling and preparation

practice, since these stations are a group of the best plants to be found in operation. Of this total cost of 0.86, the fixed charges amount to 0.5 cent and the total production charges 0.36 cent, approximately a 60-40 division.

From the investment and operating charges shown by representative new stations it would seem to be advisable to study these stations carefully from a cost point of view before building new power stations. Apparently there is an opportunity to save or to lose more than $120,000,000 a year, depending upon how well the industry capitalizes upon the power station data available.

As was to be expected in pioneering work, the variety of station designs resulted in wide ranges in fixed and operating charges, yet thermal efficiency ranges were small. Some efforts to get high efficiency at the expense of larger investment charges failed to produce results, but in other cases appreciable gains were made.

Opinion in station design should not lead to new stations that have a high first cost or a high operating cost. As a general principle it is apparent that economic factors should dominate station design. Some plants have an excessive equipment cost and a high labor cost, yet produce poorer over-all economic operating results than cheaper and simpler stations. No positive conclusions can be made that cost of fuel or load factor have been determining elements in the cost of operation or the efficiency of the group of stations surveyed.

Station generating costs afford little measure of the system cost of energy. The heavy investment and operating charges involved in transmission, substations and distribution systems are several times those involved in generation. . . . The range in costs is understandable when different states of ultimate completion of plants, differences in operating and load conditions, differences in fuel and radical departures in design are all taken into account. Direct comparisons of these costs are not intended except as yardsticks to make new stations better and cheaper. The author wishes to acknowledge the constructive attitude of utilities in making it possible to record and analyze the data given in this article.

CHAPTER VIII

THE LABOR FACTOR IN THE PUBLIC SERVICE INDUSTRIES

100. The Background of Labor Relations of Public Utilities*

Nowhere in the literature or trade periodicals of public utilities do we find any statement of the general nature of employer-employee relationships in public service industries.[1] Most of the material concerned with this type of economic relationship deals with certain minutiæ of practical policies of labor administration. There is room, it would seem, for stating some of the more general considerations that tend to set the labor bargains of public utilities somewhat apart from similar relationships in private industries. Particularly is this desirable for a group of industries whose other economic relations place them legally in a class by themselves.

The purpose of this article, therefore, is merely to give a picture of the setting of employer-employee relationships in public service enterprises. In order to place the labor bargain in its proper perspective, it is desirable to think of it in connection with the other transactions into which a utility enters in the course of business.

From the quantitative standpoint this may be done in two ways: (1) By dividing the annual inflow of operating revenue into the separate streams that go to wage earners, bondholders, stockholders, sellers of materials, taxpayers (Tables 45 and 46); (2) By dividing similarly the annual outflow of operating expenses required to produce the revenues (Tables 47 and 48). These ratios indicate in general the relative pecuniary importance of wage-earning labor in the economy of the several types of utilities. They show, for example, that the labor factor is of predominant pecuniary importance in all the utilities ex-

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* E. W. Morehouse, *Journal of Land and Public Utility Economics*, V (Aug.-Nov. 1929), 275.

[1] The best condensed general analysis of public utility labor relations is found in M. G. Glaeser, *Outlines of Public Utility Economics* (New York: Macmillan Co., 1927), Chaps. 23 and 24.

TABLE 45

APPORTIONMENT OF OPERATING RECEIPTS *

	1922				AVERAGE 1902-1922			
	Labor [a]	Investors	Material Men	Government	Labor [a]	Investors	Material Men	Government
Steam Railways	46.5%	20.6%	27.5% [b]	5.4%	42.5%	29.5%	23.9%	4.1%
Electric Railways	43.8	22.1	27.7	6.4	37.7	39.9	24.6	5.8
Commercial Light and Power	20.7	37.4	34.1	7.8	21.0	38.3	33.3	5.4
Telephone	53.6	36.0	3.1	7.3	44.6	41.7	7.6	5.2
Telegraph	50.1	21.1	24.3	4.5	39.2	29.1	28.9	2.8

[a] Includes wages and salaries.
[b] Includes some other operating expenses.

* Based upon Census returns. This compilation is taken from Glaeser, *Outlines of Public Utility Economics*, p. 110.

TABLE 46

RATIOS OF WAGES TO TOTAL OPERATING REVENUES OF PUBLIC UTILITIES BY CENSUS YEARS, 1902–1922 *

TYPE OF UTILITY	YEARS				
	1902	1907	1912	1917	1922
Steam Railways	39.1%	41.4%	44.0%	43.3%	47.5%
Electric Railways	32.2	32.1	29.8	32.0	37.0
Electric Light and Power	17.2	13.1	11.8	10.7	11.5
Telephones	30.5[a]	26.8[a]	24.9[b]	33.0[b]	37.7[c]
Telegraphs	....	....	....	....	32.76
Gas	13.7[d]	12.5[d]	12.1[d]	16.1[d]	

[a] Figures for 1902 and 1907 include mutual as well as commercial companies.

[b] Figures for 1912 and 1917 include only companies reporting incomes of more than $5000.

[c] Figures for 1922 include only companies reporting incomes of more than $10,000.

[d] Figures are for Manufacturers Census years, 1904, 1909, 1914, 1919, 1924. Ratio of wages to "value of product."

TABLE 47

RATIOS OF WAGES TO OPERATING EXPENSES OF PUBLIC UTILITIES BY CENSUS YEARS, 1902–1922 †

TYPE OF UTILITY	YEARS				
	1902	1907	1912	1917	1922
Steam Railways	60.5%	61.3%	63.7%	61.4%	59.8%
Electric Railways	57.76	54.94	52.50	51.55	53.34
Telephones	47.31[a]	42.45[a]	37.70	48.09	53.82
Telegraphs					41.92
Electric Light and Power	28.82	23.99	22.05	18.82	20.22
Gas (Mass.)	15.2	16.6	14.5	15.2	14.9 (1921)
Gas, Mfd. (U. S.)......	23.3[b]	22.2[b]	19.9[b]	20.4[b]	

[a] Figures for 1902 and 1907 include operating expenses of mutual as well as commercial companies.

[b] Ratios of wages to cost of materials plus rent, taxes and salaries and wages. Figures are for Manufacturers Census years, 1904, 1909, 1914, 1919, 1924.

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* Based upon statistics from the Interstate Commerce Commission and the Bureau of the Census. See unpublished thesis by John D. Sumner, *A Survey Analysis of Public Utility Expenses*, Northwestern University, 1926, and compare Glaeser, *op. cit.*, p. 525.

† Data for steam railways compiled from Interstate Commerce Commission reports; for electric railways, telephones, telegraphs, electrical light and power and manufactured gas (U. S.), from reports of the Bureau of the Census; for gas utilities in Massachusetts, from reports of Gas and Electric Commission and Department of Public Utilities in that state.

TABLE 48

RATIOS OF WAGES TO OPERATING EXPENSES OF GAS UTILITIES IN MASSACHUSETTS, 1900–1921 *

YEAR	RATIO	YEAR	RATIO
1900	16.2%	1911	15.2%
1901	15.0	1912	14.5
1902	15.2	1913	14.5
1903	15.3	1914	14.7
1904	14.4	1915	14.4
1905	14.5	1916	15.0
1906	17.2	1917	15.2
1907	16.6	1918	15.0
1908	16.4	1919	15.6
1909	16.5	1920	17.4
1910	15.8	1921[a]	14.9

[a] Publication of statistical reports of Department of Public Utilities was discontinued after 1921.

cept electric and gas.[2] From 10 per cent to 50 per cent of the flow of revenue is transformed into wages; from 15 per cent to 65 per cent of operating expenses consists of compensation to manual workers.

Despite the magnitude of the labor item, it is likely to be scrutinized less closely by regulatory officials than is any other revenue share or expense item. Why? For an answer we have to delve into economic history practically as far as in seeking the genesis of the peculiar system of rights and duties in which public utilities function. But without tracing the devious path from slave labor to the system of free labor,[3] it will suffice to point out that modern economic society recognizes in general that efficiency and willingness to work are closely associated. We have reached the stage where legally, to a certain extent economically, and to a large degree customarily, a worker may begin or quit work at will. Liberty of contract between employers and employees, in brief, results in greater productive efficiency and social advantage. This legal doctrine and the customs and statutes which are its basis and expression form the

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* Data computed from Reports of Gas and Electric Commission and Department of Public Utilities, Massachusetts.

[2] If adequate data were obtainable for water utilities, these would doubtless be classed with the electric utilities.

[3] See, for illustration, Harry M. Cassidy, "Emergence of the Free Labor Contract in England," *American Economic Review*, XVIII (June, 1928), 201-226.

institutional foundation of employer-employee relations in both private and public service industries.

This common institutional setting of labor relations does not, however, make the labor problems of utilities identical with those of private industries. The explanation of this apparent paradox throws light on all utility labor problems. If the relations between utility managers and employees could be isolated from all the other relations into which these managers enter, we might then say that the labor relations of utilities, in so far as they have a common legal foundation with those of other industries, were not different. In this isolated sphere, the managers of a utility are practically subject to no greater legal restraints in dealing with employees than are the managers of a steel plant.

What distinguishes the labor relations of utilities is the peculiar obligations imposed on utility managers in their *other* relations. These obligations are well known. They are evidenced by the degree of governmental interference in, and scrutiny of, all the other revenue shares and expense items which were indicated above. A utility's duty toward consumers, for example, is to render continuous and reasonably adequate service at reasonable rates and without unreasonable discrimination. In return the utility has been assured the right to demand that consumers give, through rates, a sufficient flow of revenues to permit the enterprise to perform its duties. In enforcing these reciprocal rights and duties public officials have extended the sphere of their control over all the other relations of a utility's managers, except those with labor. By contrast, the wage-earning employees of utilities have practically no legal obligations to consumers, owners, or investors. Under ordinary circumstances, no legal obligation rests on employees to give continuous service at reasonable wages. But, in theory at least, management cannot escape its obligations. Thus the managers of utilities face the difficult task of developing an attitude of mind among employees that will produce results equivalent to those required by this legal obligation, for only as they succeed in doing this can they meet their own obligations to consumers. This is the attitude of management.

But what of consumers? From their standpoint is there anything distinctive in the labor situation in public utilities? This question also may be approached from the standpoint of obligations. Consumers' interests in continuous service and reasonable rates tend to make them attach to labor a moral obligation to refrain from strikes and unreasonable wage demands. Moreover, a strike on a public utility is almost certain to attract wide publicity and appear to affect consumers' interests more directly than in the case of a private industry. These features arise from the inherent nature of public utilities as a class, since one of their distinguishing characteristics is a high degree of consumer dependence on their services. To this characteristic chiefly may be attributed the tendency of consumers to criticize strongly sometimes the company and sometimes the workers for any interruption of service on account of strikes or for rate increases occasioned by higher wages.

This attitude of mind among consumers has not been ignored by trade union leaders. Fundamentally it probably accounts for the fact that many officials of trade unions in the utility field have come to realize that in strikes they are handicapped from the beginning by having to overcome a more or less instinctive public resistance.[4] Accordingly, the Amalgamated Association of Street Railway Employees require arbitration before resort to the strike weapon and most unions in the utility field seek first to attain their ends by other means than an interruption of work. Thus the pressure of public opinion, reflecting consumers' attitudes, has tended to substitute the counsel of expediency for either a legal prohibition of strikes or a free use of the strike threat as an aid to bargaining. In other words, in addition to management's attempts to set up a moral obligation of labor to remain at work, public opinion likewise erects a similar moral obligation. The two together have the effect of providing a psychological setting which makes bargaining for wages or working rules on utilities different at least in degree of difficulty, if not in kind, from similar bargaining in private industries.[5]

[4] The most recent illustration is the "postponing" of the Pullman car porters' strike call. President Green of the American Federation of Labor is reported to have advised: "Economic conditions are not favorable to the success of a strike now. Public opinion has not been crystallized to approval of your demands." *Chicago Tribune*, June 8, 1928, p. 1.

[5] On logical grounds, a plausible argument may be made that collusive agreements between public utility managers and employees are more likely than in other industries subject to greater competition, particularly when the employees' organization includes only those on the company payroll. Some of the utilities are substantially protected from competition; consumers are virtually dependent on continued service regardless of cost; under normal circumstances a utility may count upon permission to charge rates which will at least yield operating expenses plus some return on the investment; the commissions' practice of avoiding interference with labor relations weakens the check upon operating expenses which such scrutiny affords in the case of other types of expenses; hence the burden of higher wages may easily be passed on to consumers. So runs the argument.

Collusion in labor bargaining is difficult to prove or disprove, for it is usually under cover. It can never be proved by logic. In the writer's

Another aspect of wage bargaining which tends to distinguish labor relations on utilities may be described as "the burden of proof." The managers of a utility, representing the stockholders, are in a position to counter-attack a demand for a wage increase by saying: "The return to stockholders is limited. Your request for increased wages can only be met by increased rates. The regulating commission must decide whether consumers may be called upon to pay higher rates." This inability-to-pay argument has interesting and significant results that can be seen in almost any arbitration of a public utility labor dispute. (1) It transfers the burden of proof from the employer to the workers who thereupon fall back upon the standard of living argument which is the usual defensive argument against a reduction of wages, much as the cost of living showing is usually an offensive weapon for higher wages. Yet when increased wages are demanded in private industry, ordinarily, in times of rising prices at least, the employer is the one who has to justify a denial of the increase. In the case of the utilities, however, labor generally has not only to justify its own demands and standards of living but also to prove the employers' ability to pay.[6] (2) The

opinion, the presumption is against such collusion on the utilities. For one thing, collusion ordinarily implies close and disciplined organization on both sides and this is lacking for the most part except on the transport utilities. Again, utility employees as consumers of utility services are as dependent on such services as other consumers. Moreover, regulating commissions have the power to scrutinize and publish their suspicions of collusion if that appears probable from the facts in a case, even though they may not order directly a reduction of wages. Finally and most important, utilities in both their labor and consumer relations are not as free from competitive influences as is ordinarily inferred from their monopolistic organization; rates and wages have economic limits just as other prices do. Indeed, even a cursory examination of wage rates and earnings in utility and non-utility employments will reveal no clear, objective test of the presence of collusion against consumers' interests.

[6] Moreover, in accepting the burden of proof, spokesmen for labor may be further handicapped by inability to obtain the information needed which largely is in the hands of the companies. The secrecy with which many company officials surround much of the data bearing on labor relations is well known. This policy is likely to prove more embarrassing to employee representatives in an "inside" union than to spokesmen for members of an "outside" union. In addition, the expense of arbitration proceedings is an item of importance, especially for groups of employees without large funds. The incidence of these expenses is not subject to safe generalizations. Superficially considered, these expenses are met entirely out of wages of the unionized employees involved, whereas the company's expenses in arbitration or litigation are included in operating expenses which in the long run are met by consumers. But under some circumstances the workers' burden of expenses may be shifted to stockholders or consumers through higher wages, and the management's arbitration expenses may be reflected in reduced net earnings (and dividends) for the year in which the expense

burden of proof may be even heavier under some circumstances. In asserting management's ability to pay labor's spokesmen may be put in the position of challenging the effectiveness of regulatory agencies. To prove that the company can pay higher wages without increasing rates implies that regulatory officials have not kept returns to stockholders down to reasonable levels. Thus under some circumstances those who demand wage increases may find themselves arrayed not only against the stockholders of the company but also against public officials whose administration of their duties is called into question, to say nothing of consumers whose interest in low rates is immediately affected. That these considerations increase the difficulty, and limit the scope of wage bargaining will be attested by many participants in arbitrations of public utility wage disputes.[7]

These general considerations may be summarized in the statement that labor bargains in public utility industries differ from similar relations in private industries chiefly in the blending of liberties and duties and the psychological consequences of this blending. The system of free contract, which, in legal theory at least, characterizes employer-employee relations generally, is necessarily modified in practice by the duties imposed on utility managers and indirectly transferred to a certain extent to their employees. To this blending of legal and moral compulsion and freedom may be attributed most of the peculiarities of utility labor relations.

In addition to these general features, certain other factors stand out in a comparative survey of labor on utilities and in private industries. These may be grouped conveniently under three heads: (1) Technological factors; (2) Business or market factors; (3) Social factors. The lines of division among these three groups are frequently very dim and blurred, but the distinctions may help to paint a clearer picture of the environment in which dealings between utilities and their employees take place.

was incurred. The exact ultimate burden of arbitration expenses can only be determined by careful study of each case.

[7] Three recent cases under the Railway Labor Act illustrate the above statements: (1) *Chesapeake and Ohio System Federation No. 41, Railway Employees Department, A. F. of L.* v. *C. & O. Ry. Co.*, U. S. Board of Mediation, Docket C-251 (1928); (2) *Brotherhood of Locomotive Firemen and Enginemen* v. *Certain Western Railroads* (Western Firemen's Case), U. S. Board of Mediation, Docket C-266 (1927); (3) *Re* Brotherhood of Locomotive Engineers, Brotherhood of Locomotive Firemen and Enginemen, Order of Railway Conductors, Brotherhood of Railroad Trainmen and Kansas City, Mexico, & Orient Railway System, *Report of Emergency Board*, U. S. Board of Mediation, Docket CI-347 (1928).

The variety of tasks in rendering public utility services is so great that generalizations about them are especially liable to exceptions. For this reason it is important to keep in mind a rough classification of jobs. A statement that may be true for employees engaged in moving trains may not apply to the employees who work in the shops. Some jobs are more affected than others by changes in technology; business or market developments may destroy some jobs, minimize the importance of others, or create new ones, and the effects of one type of business change may differ markedly from the effects of another sort of change. For example, should train crews refuse to move trains, the effect upon passengers or shippers would be felt immediately, but if the shopmen should strike, the effect upon patrons would not be immediately apparent. This suggests the need for separating those employees engaged in moving trains (transportation employees) from those engaged in maintenance work, whether of way and structures or equipment and stores. Moreover, for some purposes even the transportation group may have to be separated further into train and engine service (road engineers, firemen, conductors, trainmen, yard engineers, switchmen, etc.), track operations (such as towermen, telegraphers, gatemen, and flagmen), and station service (such as station agents, ticket agents, freight handlers). These jobs present diffiences among one another, just as, considered as a group, they differ from either the maintenance group or the 200,000 or more clerks, draftsmen, or other professional, official and office workers.

The electric railways furnish another illustration of the importance of job-classification. This industry has experienced difficulty in marketing its services at a profit. One result has been intensified pressure to reduce unit operating expenses. One-man cars have been introduced. What have been the effects on labor of these related business and technological developments? One-man cars have merged the duties of conductor and motorman and have tended to reduce the number of such jobs per unit of service. But they have not appreciably altered the duties of the shopmen who maintain the equipment, the men who maintain the way and structures, or the office employees. Yet the slowing up of electric railway traffic expansion may have started a cycle of influences resulting in stiffened resistance to wage changes affecting practically all classes of employees, though in differing degrees.

Similarly in other utilities the variety of tasks necessitates classification. Power-house employees in the electric industry do not perform their duties before the eyes of patrons but their work is more vital to continuous operation than that of a meter reader who daily comes into contact with customers. Consider also the work of "distribution" employees as distinguished from power house or "generation" employees. Should a breakdown in service occur, the difficulty is far more likely to be found in the distribution line than in the generating station itself. The work of linemen who make emergency repairs under these circumstances becomes of very great importance to consumers whose supply of electricity is shut off, far more important indeed than the very similar work of linemen merely engaged in constructing a new transmission line. This suggests the necessity of separating distribution employees engaged in maintenance work from those engaged in new construction. Finally, in the electric and gas industries particularly, the activities of so-called commercial and sales employees, such as meter readers and appliance salesmen, have a more than ordinary importance in the industry's functioning.[8]

TECHNOLOGICAL FACTORS

Bearing in mind these general differences among utility jobs, some of the technological factors affecting the type of work, and through this the type of worker needed, may be reviewed. The following technological factors appear particularly striking: (1) the dominance of the machine technique; (2) the peculiar union of the machine technique and personal service; (3) and the dispersion and decentralization of productive activity.

1. *The Machine Technique.* It is commonly observed that utilities have a large and increasing amount of capital investment per worker. (Table 49.) This indicates a rather pronounced influence of machinery on the job—on all sorts of jobs including even some phases of office work. Sometimes this influence of new machinery is good and sometimes bad—from the employee's standpoint: it may lighten his load,[9] or increase his responsibilities, reduce him to the ranks of the unskilled, or displace him from a job altogether.[10]

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[8] Similar groupings of telephone, telegraph and gas industry employees will suggest themselves to the careful reader. In all utilities a large proportion of the work is clerical and office work of one sort or another.

[9] As the automatic stoker lightened the locomotive fireman's work after lengthened trains and larger locomotives on some railroads had made his job almost unendurably back-breaking.

[10] Not every new machine is an unmixed good from labor's point of view, though management may welcome the reduced unit costs. The steam shovel

With the exception of certain occupations on transport utilities, this wide use of machinery does not usually have the result noted in other industries; namely, forcing the worker to adjust himself to the pace of the machine. Public utility services are not generally suited to a conveyor system. By and large, the machinery in non-transport utilities is of the automatic type that requires only intermittent labor. Even in the transport utilities the increased size of units of equipment is often accompanied by new labor-saving devices.[11] Though the substitution of mechanical contrivances for handwork has made utility jobs easier on the whole, nevertheless it has added to the responsibilities of some workers and under some circumstances it has also tended to displace labor. To the workers this has meant the loss of property in the form of skill or jobs.[12]

TABLE 49

VALUE OF PLANT AND EQUIPMENT PER EMPLOYEE, BY TYPES OF UTILITIES AND BY CENSUS YEARS, 1902–1922 *

TYPE OF UTILITY	YEAR				
	1902	1907	1912	1917	1922
Steam Railways	$ 8,961	$ 7,792	$ 9,324	$10,086	$12,650
Electric Railways	15,398	16,428	16,272	17,421	16,823
Commercial Light and Power	16,643	23,028	27,423	28,997	29,616
Telephones	4,943	5,690	5,897	5,873	7,335
Telegraphs (land and cable)	5,852	7,492	4,955	3,759	4,759

* Values are not corrected for changes in prices. Data for steam railways are taken from Interstate Commerce Commission Reports and for other utilities from Special Census Reports.

On the other hand, the dominance of the machine technique necessitates recruiting a labor force which has a relatively high

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has transformed ditch-digging from a job requiring muscle to a job requiring mechanical deftness and displaced thousands of ditch-diggers.

[11] Even when the introduction of machinery does not displace labor from public utility employments, it tends to weaken labor's bargaining power by restricting alternative opportunities of employment outside the utility field. Machine production in general puts a premium on the quick reactions which characterize youth, and has a tendency to shorten the most remunerative period of a worker's life. Hence, the longer a man remains in a public utility job, the less favorable become his chances of securing remunerative employment in other occupations.

[12] One-man cars have raised this issue among street-railway operators and the duplex automatic telegraph printing machine has similarly agitated the telegraphers—to mention only two illustrations.

proportion of technical talent.[13] The need for technical information, more than mere rules-of-thumb, extends even to occupations ranking fairly low in the scale of utility jobs. This aspect of the influence of technology on the type of workers needed by utilities is too patent to require elaboration.

2. *The Peculiar Union of Machine Technique and Personal Service.* Personal labor at the point of being served and the inability to accumulate reserve supplies for customer demands are two technological characteristics of utilities that set this group of industries somewhat apart from other business enterprises.[14] What do these two characteristics, *taken together,* mean to the workers?

When service must be given at the instant of demand and such service requires a large labor force at the point of service, jobs cannot easily be adjusted to the convenience of workers. The peak load service requires a peak labor load with a lay-off for these employees during the off-peak period.[15] This is particularly striking in the case of operating jobs on railroads,[16] street-railways, telephones and telegraphs.

The identity of the points of production and of consumption also makes certain classes of employees potential advertisers for the company. Ordinarily in factory employment the workers are never known to consumers of the products of their labor. But in the case of utilities these contacts between producers and consumers are many and varied. Within the past few years the managements of various utilities have recognized that these contacts may be a source of strength in cultivating a community

[13] One reflection of this is the prominence of technical courses for employees offered by many utility companies as part of their industrial relation activities. For another bit of evidence compare the technical departments of such labor periodicals as the *Electrical Workers Journal* and the *Locomotive Engineers Journal* with the material appearing in non-utility labor papers.

[14] This statement does not apply, of course, to gas and water utilities whose product is a storable commodity enabling the utility to avoid a peak labor load in order to meet peak demands. For this reason these are sometimes referred to as *product* utilities as distinguished from the *service* utilities of transport and communication. Electric utilities seem to occupy a middle position. Electricity cannot economically be stored in advance of demand, but, once the equipment is in place, practically no personal labor at the point of being served is required. Automatic switching of telephone calls and automatic sending of telegraph messages are tending to make a considerable portion of the service of communication like electric service as far as these characteristics are concerned.

[15] In addition to irregular daily or weekly employment, other consequences are more closely related to business and social factors considered later.

[16] See, for example, the following analysis of time spent by Australian locomotive engineers on various duties. This analysis was submitted in the

opinion favorable to their interests. Many of them have urged the slogan to employees, "To the public you are the company." The expectation is that employees who are conscious of this fact are more likely to be courteous and considerate in their dealings with customers and thus to create a public good will that serves not only as a buffer when the company is criticized but also as an aid in customer financing.[17] One result of this policy is that a utility will introduce a public relations test in selecting employees for those jobs which are before the public eye.

Another angle of these close contacts between producers and consumers is the relation between employees' work and public safety. In a great many factory employments the individual's work has rather slight influence upon the safety of those who consume the products or of the general public. But in the case of utilities, particularly those engaged in transport service, employees have a heavy responsibility for the safety of patrons and the general public.[18] Failure of management to have regard for

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recent 42-hours case before the Australian Commonwealth Court of Arbitration. *Locomotive Engineers Journal*, May, 1928, pp. 334, 335.

The Shorter Work Week on Australian Roads

Locomotive Drivers (Engineers)

	Hours	Per Cent Total Time
1. Total time on duty of all drivers	152,106	
2. Time of drivers on shed duties	4,684	3.1
3. Time of drivers travelling as passenger and waiting	13,040	8.6
4. Intervals at out-stations between periods of duty	4,160	2.7
5. Standing time of trains	24,654	16.2
6. Shunting	28,909	19.0
7. Attending inquiries, examinations, conferences, etc.	1,042	.7
8. Engine requirements	27,763	18.2
9. Running time between stations	47,853	31.5

Electric Drivers (Motormen)

1. Preparing and putting away trains	8
2. Signing on and off and waiting	14
3. Interval time at terminals	14
4. Meal time (paid for)	6
5. Shunting	6
6. Standby time and lectures	5
7. Actually running trains	47

[17] Of similar import is the policy of one large utility serving a wide territory to hire only persons who live in the communities served. Moreover, some railroads on the basis of harmonious labor relations have used employees to attract shippers from rival lines.

[18] "The very nature of their (locomotive engineers) service, involving as it does the custody of human life, and the safety of millions of property,

this factor has often resulted in heavy accident expenses to say nothing of public ill will and loss of confidence. Control of this factor requires selecting employees who are physically fit, have a well-developed sense of responsibility and good judgment, and are careful in the work that they do.[19] In recent years realization of this safety problem, stimulated doubtless by the general safety movement in industry, has prompted many utilities voluntarily[20] to introduce physical examination of prospective employees and periodic tests of those already engaged. Such a policy is, of course, not confined to utilities but in these industries it has on the whole greater significance than to consumers in private industries whose operations do not so directly involve public safety.

3. *The Dispersion and Decentralization of Productive Activity.* Associated with these features of utility services is the characteristic dispersion or decentralization of productive activities. Though the mobile work-place is most peculiar to operating jobs of transport enterprises, a certain amount of decentralized production is found in other utilities. The rendering of gas, electric and telephone service, in the larger communities at least, does not all take place under one roof. Telephone exchanges, gas works, and electric generating stations may be located in different sections of the city. Moreover, the company's property occupies myriad rights-of-way to consumers' premises, which necessitates roving workmen when repairs or installation changes are made. All these features of utility operations, summed up in the phrase ''dispersion of production,'' aggravate the problems of discipline, supervision and efficiency.

Recently Professor Goodrich has described[21] what he calls the ''indiscipline of the mines'' where miners work most of the time under no immediate supervision. Professor Goodrich attributes to this feature of the working life of the miner a good deal of the individualism and independence which characterizes that class of worker. Some of that indiscipline seems characteristic of certain types of utilities, where the work of the employee

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imposes upon them obligations and duties commensurate with the character of the trusts committed to them." *Toledo, Ann Arbor & North Michigan Ry. Co.* v. *Pennsylvania Co.*, 54 Fed. 746, 753 (1893).

[19] The Chicago Surface Lines recently gave a dinner to about 5000 trainmen who had a perfect no-accident record during the preceding year.

[20] Such voluntary practices establish standards higher than the compulsory standards embodied in the legislation of some states, such as testing enginemen for color blindness.

[21] Carter Goodrich, *The Miner's Freedom* (Boston: Marshall Jones Co., 1925).

is not under immediate supervision. For example, a train crew is more or less on its own responsibility from the time it leaves its terminal. Similarly, the conductors and motormen of street-railways or elevated trains have responsibilities which are not subject to constant check by superiors having power to discipline during the hours of work unless indirectly through the use of so-called "plain-clothes inspectors" or "spotters."

The difficulty or impossibility of close supervision necessitates from the company's point of view selecting for employees those who seem to possess a sense of responsibility or a measure of self-discipline. At the same time freedom from close supervision may attract workers who resent the watchfulness of a supervisor.

Related to this "indiscipline" of utility jobs is the difficulty of controlling all the details of a labor policy from a central office.[22] The Public Service Company of Northern Illinois, for example, has stations scattered over a considerable territory. No one station is large enough to support a labor or employment manager, and consequently the foreman or superintendent is charged with responsibility in dealing with labor. Industry is replete with illustrations of foremen's abuse of the privilege of hiring and firing. Unless restrained or unless a high type of person holds the position, the tendency is for a foreman to act as though he were an "over-lord." The consequences have been shown to be disastrous for employees as well as company. Where progressive managements have recognized this difficulty, they have shorn the foreman of much of his arbitrary power to hire and fire. In most large utilities as in up-to-date private concerns, the local shop foreman or plant superintendent may hire only within certain general limits laid down by the central office and may not "fire" from the company's employ, though he may separate an employee from any job within his jurisdiction. Such arrangements emphasize the fact that the technology of the utility industries in so far as it requires decentralized production not only handicaps organization of the workers but also increases the difficulty of carrying out a consistent and uniform labor policy.[23]

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[22] Only 17 of 184 electric companies reported centralized employment departments to the Industrial Relations Committee of the National Electric Light Association *Proceedings*, 1925, p. 168.

[23] The technique of the public utility industries affects the agreeableness or disagreeableness of work in about the same way as in some types of factory employment, again illustrating the fact that the so-called distinguishing characteristics here noted are differences of degree more than of kind. No one who has worked in a steel plant as well as in a gas plant

Business or Market Factors

No hard and fast line divides the business or market influences on utility labor relations from the technological factors heretofore mentioned. In many cases the technical requirements of service dictate a particular market situation which in turn has its effect upon labor relations. The close affiliation of these two groups of factors is seen in the above-mentioned contacts between primary producers and consumers. The fact that utility products and services are usually carried to and used directly[24] on the customer's premises or on public property is a technological feature that also has marketing significance. The development of new outlets for service through employee contacts with customers is a pertinent illustration.

Three outstanding characteristics of utility markets deserve mention as affecting labor relations: (1) the monopolization of markets; (2) the localization of markets; (3) competition in the labor market in relation to monopoly and localization.

The effects on labor relations of the *monopolistic organization* of utility markets are fourfold: (1) workers are assured of a relatively permanent demand for their services;[25] (2) there is

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can say that there is anything peculiarly disagreeable or hazardous in periodically cleaning out a gas oven. In other words, the hazards of moving parts, the endurance of extremes of heat and cold, contacts with electricity and chemicals, are about the same in the case of utilities as in the case of similar private employments, although some utility jobs have greater accident and sickness hazards than the common run of jobs in private industry. Weather and climate sometimes prolong jobs under the most arduous conditions, and utility employees are expected to accept such experiences as part of their work. This is particularly true of the operating jobs of the transport utilities and to a lesser extent of the maintenance and trouble work of electric, gas, and telephone utilities. See Robertson, *Feeding the Iron Hog*, pamphlet published by Brotherhood of Locomotive Firemen, in which the work of a fireman is graphically described.

[24] We have not yet developed commercially the transmission of electric power by wireless, though the transmission of news and pictures by radio has developed tremendously in recent years.

[25] This statement does not apply, of course, to particular individual workers nor does it mean that tenure of jobs will be secure and continuous. As a matter of fact, records of the Interstate Commerce Commission show that the index of employment on Class I Railroads declined in four of the past five years. The indexes follow:

Year	Index
1923	100.
1924	94.5
1925	94.1
1926	96.1
1927	93.7
1928	85.9[a]

[a] Average for 3 months.

reasonable assurance that the flow of revenues out of which wages are paid will continue,[26] *i.e.* that the source of wages will not dry up; (3) an offsetting factor is that monopolization of the market curtails the opportunities to obtain similar employment in some occupations;[27] (4) the monopolistic position and power of local utilities is felt to be a source of strength to the companies and a handicap to labor in negotiating wages and other terms of employment. Professor Berman implies this attitude when he states in a recent review: "The author [of the book reviewed] asserts that, since continuance of service may be legally demanded of public utilities, there is no ground for distinguishing between the legal positions of the employees of such concerns and their employers. In the opinion of the reviewer there is such ground for distinction. Public utilities have a monopoly; their employees do not. Furthermore, in the long run, the utilities are assured an adequate return by the commissions which set rates. Public utility employees are generally assured neither an adequate wage nor continued employment." [28]

On the other hand, it is sometimes said that trade unions, if strongly organized, prefer dealing with a monopolistic organization because dealing with a single large employer facilitates enforcement of uniform standards over a wide territory. However, the experience of the railroad unions with national agreements during the period of federal control does not altogether bear out this position. Uniform standards over a wide area tend to benefit employees in smaller communities by reducing standards for those in larger communities. The labor market is still largely localized in character. Moreover, the employees of local utilities, though dealing with local monopolies, are yet subject to competitive influences.

In short, the fact that many utilities have substantially exclusive control over the markets for their services is overshadowed in its effect on labor relations by the *localization* of utility markets and the competition in the labor market. Though the steam railroads and telegraphs serve primarily a regional or national market, the bulk of the demand for street-railway, telephone, electric, gas and water services comes from the immediate locality. True, the interconnection movement is tending to widen the market for electric service, but by and large at least half of utility services are rendered locally whereas a steel manufacturer or a maker of electrical equipment, for example, may function in a national or world market.

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[26] The size of the revenue stream and the proportion obtainable for wages are different matters.

[27] This refers to local opportunities for similar employment and applies especially to home-owning workers with families who therefore may be reluctant to move to another community.

[28] *American Economic Review*, XVI (1926), 129.

What effect does this characteristic have on labor bargaining? For one thing, it tends to make the standard of wages and working conditions in the immediate locality a determining factor for that locality alone. Referring again to the effects of national agreements on the railroads during the War, it was found that owing to the variety of local customs and usages, habits of living and costs of living, standardization brought more difficulty than simplicity. Should the national standard be fixed to satisfy the requirements of workers in and around New York, or should it be fixed to satisfy the requirements of workers in and around Phoenix, Ariz.? This hypothetical case illustrates the difficulty of reconciling standardization with equity in adjusting labor relations upon a national scale. With the relatively localized markets of utilities, presumably it should be easier to make the labor bargain fit local conditions and local requirements.

The probability of equitable labor relations is a different matter in which the competitive nature of the labor market figures. The one-sidedness of competition in the labor market has frequently been noted.[29] The employers are relatively few in number, they are likely to be closely organized and to exchange privately labor market information; they have a common interest in acting together in the scale of wages offered; they have greater financial resources to fall back upon when labor is a limiting factor than have workers acting as individuals. On the other hand, unless the union has survived from the days before large corporate and trust organizations, the prospects of trade union organization are slim; the workers are too numerous to be mobilized easily for effective collective action; they have to rely largely on scattered, hearsay information regarding alternative jobs, and wages and working conditions therein; individually they are comparatively deficient in reserves to tide them over periods of unemployment and their power to veto unfavorable terms of contracts is weakened correspondingly; protests against unfavorable terms of existing contracts are made effective chiefly by quitting, unless there happens to be an energetic union or an employee representation scheme that does not smother incipient revolts. These and other characteristics noted by the cited authors account for the one-sidedness of labor competition. And although their analysis pertains to industry generally, it also applies to utilities with some differences in degree.[30]

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[29] *See*, for example, Solomon Blum, *Labor Economics* (New York: Holt and Company, 1925), pp. 187-191; and S. H. Slichter, reviewing Douglas, Hitchcock and Atkins, "The Worker in Modern Economic Society," *Journal of Political Economy*, XXXIV (1926), 100-124.

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[30] The Royal Commission of the Canadian Government which investigated the Toronto Telephone strike advocated government regulation of labor conditions in public utility enterprises to the extent indicated by the following quotation from their report, *Report on Toronto Telephone Strike*, p. 37.

"As far as the city of Toronto is concerned, and many other localities throughout the Dominion in which the Bell Telephone Company operates, this company has an absolute and complete monopoly. It enjoys this monopoly by the consent of the public. That this consent arises from a city's consideration of its own convenience rather than from any predisposition in favour of a particular company is not a matter of concern. The fact is that in the city of Toronto there is one company carrying on the telephone service for the entire city, and whether they like it or not the public generally of that city, so far as it may wish to make use of the telephone, is obliged to pay the Bell Telephone Company for its service. Viewed in this light, which we believe to be the right and proper one in regard to public service utilities where an absolute or quasi-monopoly exists, an element is introduced which justifies an insistence on the part of the public of a due regard for the welfare of employees which might be urged with less reason in the case of competitive industries. To the extent to which the citizens of Toronto have parted, either voluntarily or involuntarily, with their right to choose between competing concerns, and to that extent have parted, also, with their power to extend their patronage in the direction in which they believe the interests of justice and fair play may best be served, to that extent it is, we believe, not only their right, but their duty, to know and to insist upon a company profiting by their patronage, treating its employees in a manner which is equitable and fair, in other words, giving to its employees, whether they be women or men, a fair day's wage for a fair day's work. To the extent to which the Bell Telephone Company has profited by the necessities of its operators, or has secured services at a rate which would not have enabled those who rendered them to have lived, but for the support received from members of their own families, or in ways other than those provided by the company, to this extent, the profits of the company have been derived by a species of sweating, or by the levying of a tax upon homes and individuals for which no compensation has been made.

"That the company has profited in this manner is sufficiently proved by the admissions of its own manager that the wages paid were not sufficient to meet the cost of board and clothing, and that *notwithstanding the operators had been obliged to work at a pace which was absolutely detrimental to their health*. The circumstance that these truths are lost to sight by the involved and intricate processes which obscure the workings of modern industry and commerce, or that by some they may be condoned as being in accord with common practice, is not a reason why in the public interest they should not be established. Moreover, it is, we believe, not more in the interests of justice and the maintenance of friendly relations between employers and employees, than it is likely to be in accord with the wishes of fair-minded investors who would hesitate to accept as profits, dividends which had been earned at the expense of either the health or well-being of those who had assisted in their making. And this leads us

In the labor market a utility has to compete with private industries for the services of many classes of workers. In some cases, however, the jobs on utilities are not comparable in skill, duties or technique with any position in a purely private industry. This applies particularly to the operating jobs of transport utilities [31] and to some extent to gas utilities. In the other utilities the comparability of occupations is greater and we might expect keener competition between utilities and private employers where competition is not limited by tacit agreements and forbearance. In this connection, a fact not without significance is that trade unions have succeeded in organizing effectively only the more or less unique jobs. Workers in the telephone, electric, gas, and water services are relatively unorganized into trade unions. The latest and most authentic published data regarding the degree of trade union organization in public utilities are given in Table 50.[32] The figures for 1920 represent the high point of union membership (see Table 51), although some unions, like the Amalgamated Association of Street-Railway Employees, substantially maintained or increased the membership gained during the War. This compilation (Table 50) omits the numbers of union members employed in gas and electric plants. There are a few local unions of gas workers, and some of the local unions of the

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further to venture the opinion that in the interests of shareholders, employes and the general public alike, it is desirable that as much publicity as a due consideration for business secrets will permit should be given to the manner in which public or quasi-public utilities of the class of the Bell Telephone Company, carry on their operations. Public opinion may be expected to safeguard the welfare of those who serve the public, however remote that service may be, and in this connection it may fairly be assumed that the interests of capital. no less than labour, and of labour no less than of capital, will receive a due regard."

[31] "Payment of any wage depends on the ability of an employer to receive from the public the money needed, not only for wages, but for all other expenses, including the payment of a fair rental to the owners of the property.

"*Many of the company's employees have been in its service so long that it would be difficult for them to secure other equally remunerative work.*

"Therefore, to enable these men to continue earning their living, the street-railway property must be maintained, and a rental paid to its owners. . . .

"The company's employees, and the company's managers must realize together that, whatever may be the condition of the street-railway business in St. Louis, they are in it together, and must make ends meet. . . .

"Its employees should be encouraged by the fact, as shown by the following list (omitted here), that the company is now paying them a higher maximum hourly rate of wages than is paid in all but seven other large street-railway properties in America." *The Public Servicer*, I-4 (May 1928), 5. (Employees' magazine of The St. Louis Public Service Company).

[32] The figure given for telegraphs and telephones is somewhat misleading in that the bulk of organized workers, according to this compilation, are in the Order of Railroad Telegraphers.

TABLE 50

PERCENTAGE OF TRADE UNION ORGANIZATION IN VARIOUS UTILITIES *

UTILITY	PERCENTAGE OF ORGANIZATION	
	1920	1910
Water Transport	85.5%	28.9%
Steam Railways	57.5	23.5
Electric and Street-Railways	52.9	21.8
Telegraph and Telephone	25.4	10.2
Post	24.8	31.6
Teamsters and Chauffeurs	11.9	7.0
Construction of Streets	8.3	2.4

Brotherhood of Electrical Workers are entirely or largely made up of central station employees.

Trade unions perform important functions which tend to ameliorate the effects of one-sided labor market competition. It is obvious that a trade union under capable leadership exerts considerable influence through collective bargaining on workers' wages and standards of living. This influence is not altogether confined to union members, but, under the influence of competitive wage determination, extends also to unorganized employees in the same or competing occupations.[33] To the extent that non-union workers receive indirect benefits from union activities without paying therefor in union dues, there is merit in the hostile attitude of union members toward non-unionists. But for the present purpose, the important thing is to note that trade unions stand in the way of rigorous application of the one-sided competition that normally characterizes the labor market.[34]

Probably from the workers' point of view the two most important effects of labor market competition are on wage rates and earnings, the latter concept including the idea of regularity

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* Leo Wolman, "Growth of American Trade Unions, 1880-1923," *National Bureau of Economic Research, No. 6* (1924), p. 90.

[33] This extended sphere of trade union influence is sometimes used as an argument in organization campaigns. Say union members: "If the non-union man is benefited by union standards, why should he not pay in union dues for the benefits received."

[34] It is not intended to convey the impression that trade unions furnish the only obstacle to unrestrained competition in the labor market. The self-restraint of the employer, whether proceeding from humanitarian or business motives, may be another important check. In common with business men generally, public utility managers may feel that high wages and prosperity are closely linked, and that no long-time benefit will come from taking full advantage of its bargaining power over labor in competition with other employers of labor.

of employment. Some utilities tend to adjust wage rates according to what has been called the "commodity theory." For example, a range of rates for certain occupations is established and authority given to foremen and superintendents to hire workers within that range, adjusting the wage rate to the individual largely according to the number of workers seeking jobs at the moment. On the other hand, a great deal is made of the greater steadiness of jobs in public utilities in order to attract and hold workers to their jobs and at the same time to justify to the workers wage rates that may be lower than the wage rates for similar work in private industries having less regular employment. The dependence of consumers on utility services is a presumption in favor of the steadiness of utility jobs. But this does not prove the point. Some utility jobs are, it is true, less broken by lay-off, but other positions are subject to seasonal fluctuations of 10 per cent or more as the accompanying charts show. (See page 442 f.) By and large we may say that the clerical and operating forces have relatively unseasonal work, whereas the maintenance of plant and equipment and construction groups of employees are idle upward of 10 per cent of the time.[35] The facts as to regularity of utility employment may or may not justify wage rates below the competitive level; nevertheless, competition is an influence consciously reckoned with by utilities in their wage policies and it has an important bearing upon all angles of labor relations.

Of the many other characteristics of utility business only three are here singled out for special mention of their effects on labor relations. The last mentioned of these shades over into what was meant by the earlier reference to "social factors."

Observers of tendencies in business organization have lately commented upon the swing toward "bankers' control" of industry. The utilities are not exempt from this influence. Railroads excepted, the operating organizations of utilities are of average size outside the larger urban centers, compared with such huge private industries as the Steel Corporation and the General Electric Company. The consolidation of operating utilities into large holding company systems in which banker-financiers wield a large influence, goes on apace. Accompanying this tendency and sometimes independent of it, goes a centralization of managerial decisions in the parent company or a separately organized management corporation. These changes are widening

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[35] Cf. Walter H. Dunlap, "Stability of Railroad Employment," *Monthly Labor Review*, XXVII (August, 1928), 227-236.

TABLE

VOTING STRENGTH OF TRADE UNIONS IN VARIOUS UTILITIES

1920 and

Organization	1920	1927
Water Transport		
National Marine Engineers Beneficial Association of United States and Canada	17,000	19,000[a]
International Longshoremen's Association	74,000	34,700
Masters, Mates and Pilots	7,100	3,100
International Seamen's Union of America	65,900	15,000
Total	164,000	71,800
Steam Railways		
Brotherhood of Railway Carmen of America	182,100	80,000
Brotherhood of Railway Clerks	186,000	91,200[b]
Order of Sleeping Car Conductors	1,200	2,300
International Union of Steam Engineers	32,000	30,200
International Brotherhood of Maintenance of Way Employees	54,200[c]	28,200
Brotherhood of Railway Patrolmen	2,600	900[d]
Brotherhood of Railway Signalmen	12,300	8,000
Switchmen's Union of North America	14,000	8,900
Tunnel and Subway Constructors	3,000	4,000
Total	487,400	333,800
Electric and Street Railways		
Amalgamated Association of Street and Electric Railway Employees	98,700	101,200
Telegraph and Telephone		
Commercial Telegraphers	2,200	3,900
Order of Railroad Telegraphers	48,700	35,000
Total	50,900	38,900

[a] 1922 figure—withdrew.
[b] 1925 figure—withdrew.
[c] 1919 figure—suspended 1920-1922.
[d] 1922 figure—suspended.

the gap between the workers and those having ultimate responsibility for deciding policies. What the effect will be on labor bargaining is problematical, but from past labor history there appears to be a strong probability that loss of personal contacts with employees may ripen into unsympathetic labor policies, unless the spirit and practices of "live-and-let-live" business competition thoroughly permeate the labor market. Partly to avoid this loss of personal contacts, many of the larger utility companies have followed the lead of, if not surpassed, private concerns in installing employee representation plans and welfare work of various descriptions. But while these organized substitutes for personal contacts may keep the immediate man-

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Affiliated with American Federation of Labor

1927 *

Organization	1920	1927
Post		
National Federation of Federal Employees......	38,500	20,000
National Association of Letter Carriers.........	32,500	40,000
National Association of Rural Letter Carriers...	300	600
National Federation of Post Office Clerks.......	16,200	30,000
Railway Mail Association.....................	14,400	19,400
Total..................................	101,900	110,000
Teamsters and Chauffeurs		
International Brotherhood of Teamsters and Chauffeurs, etc.	110,800	86,500
Construction of Streets		
International Union of Pavers and Rammermen..	1,900	2,000
Paving Cutters Union of United States of America and Canada	2,600	2,400
Total..................................	4,500	4,400
Miscellaneous		
International Association of Blacksmiths........	48,300	5,000
Boilermakers and Iron Shipbuilders	103,000	14,800
International Brotherhood of Electrical Workers.	139,200	142,000
International Association of Fire Fighters	22,100	16,000
International Association of Machinists.........	330,800	72,300
American Federation of Teachers..............	9,300	3,500
Total..................................	652,700	253,600
Grand Total	1,039,800	1,670,900

agers more or less informed and in touch with the attitudes or feelings of their employees, will these devices reach the minds of controlling bankers whose daily working materials are financial statements more than men and women? Moreover, even though banker-managers favor employee representation and welfare plans, will they seek such an understanding of them as to distinguish between plans based on a feudalistic conception of labor relations and those treating employees as citizens of their industry possessing property rights in their jobs? Here is a problem that may dominate the field of labor relations in the future no less of utilities than of private industries. And the problem is hardly less different when we have court control under receivership proceedings[36] in place of financier control.

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* Report of Proceedings of Forty-seventh Annual Convention of American Federation of Labor, 1927, pp. 28-29. It should be remembered that not all members of these unions are employees of public utility companies. Data are lacking to enable a separation in all cases between members in public utility and in private industries.

In addition to the direct contacts between producers and consumers, noted in another connection as a potential source of market expansion, the buyer and seller relations of utilities and their customers are characterized by a noticeable absence of credit. If not on a cash-in-advance basis, as on transport utilities, the extensions of credit are for relatively short periods. What effect this feature has on labor relations as a practical matter is not entirely clear. Perhaps the effect is not appreciable. Nevertheless, the facts that the utility may cut off service if bills are not paid and that consumers have come more or less to depend on this service make more certain the flow of revenue into the utility. Hence there is less chance of inflation based on too rosy anticipations. Conceivably this might tend to stabilize employment in the absence of other influences working in the same direction. At least for certain employees the credit feature of a utility's business relations sometimes involves the disagreeable task of entering the premises of recalcitrant customers and breaking service connections.

Probably the outstanding quality of utility businesses is the timeliness of service. The satisfaction of demands for service cannot be postponed. This, of course, is a derivative of the common law obligation to give continuous and adequate service. It means that a utility becomes subject to peak loads, daily, seasonal and cyclical, which aside from raising financial problems have certain influences on labor conditions. For one thing, since service cannot be postponed, it means that a certain proportion of a utility's employees find that their working life is out of joint with the lives of their fellow-workers. It means, to be concrete, that a street-railway man frequently can have very little social life because he is on duty at a time when his friends are off duty. Such inconveniences arising from the type of market for a utility service have their effect upon the desirability or undesirability of certain jobs in the eyes of workers. Take another example: the peak loads of telephone utilities come at different times during the day, depending upon the habits of the community served. During the period of peak loads, exchange operators have to come on duty and work at high speed,

[36] See *Arthur* v. *Oakes*, 63 Fed. 310 (1894).

but the hours of duty are at variance with the social habits of the community.[37]

Another aspect of this same time element of service is the matter of continuity of work. In the street-railway service, a considerable number of employees work for two or three hours in the morning and perhaps two or three hours in the evening with nothing in between. When such jobs can be dovetailed with other opportunities for work, the workers' position may be favorable, but frequently this cannot be done. One of the abuses claimed in many early street-railway disputes was that motormen and conductors were kept hanging around car-barns waiting for a run, and were not paid during the waiting period. Frequently, also, the fact that satisfaction cannot be postponed requires working exceptionally long hours under disagreeable conditions. Breakdowns in service during storms are cases in point. Also connected with the seasonal load factor is the regularity of work in shops. Assuming that all repair work is done inside the utility shops and not contracted out, the amount of work might be expected to vary according to the demands made upon equipment. Stabilizing employment in shops is thus an important element in labor bargaining.

SOCIAL FACTORS

This brings us to a brief discussion of the social factors influencing utility labor relations to an important degree. Probably the most important single problem of this nature is whether or not the dependence of consumers upon utility services necessitates placing labor relations on a different basis from that in private industries. Does this dependence, for example, justify compulsory arbitration of labor disputes; does it justify prohibition of strikes, a policy of individual bargaining as opposed to collective bargaining with independent trade unions or offers of labor contracts on terms less favorable than in non-utility industries; or should the jurisdiction of regulatory agencies be extended definitely to include supervision of labor bargains?

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[37] This factor was introduced in the recent hours-reduction case on the Australian railroads before the Commonwealth Court of Arbitration.

"Next to the suggested strain from responsibility, the main reason advanced by the union for the reduction claimed was that the employees are deprived of the ordinary opportunities of obtaining entertainment, self-improvement, home life or social intercourse, because they are compelled to work on shifts of irregular starting and finishing times, and of varying duration. Unquestionably railway employees in the running branch do labor under this disadvantage, and the disadvantage can never be removed so long as the community retains its present mode of railway travelling necessary to civilized living. Unquestionably, also the disadvantage is one to be recognized when dealing with the conditions of employment of the railway men who thus serve a public need. But in the main the men would still be deprived, as they are now, of many of the ordinary amenities of life. This disability is inseparable from their vocation, and was known to be so when they embraced it, and it is a matter which has influenced rates of pay and other conditions of employment." *Locomotive Engineers Journal*, May, 1928, pp. 335, 336.

Many intangibles are involved. Attitudes of mind toward these questions vary with the interests of individuals and with changing economic circumstances. Some persons honestly feel that the importance of utility services to the community at large justifies treating the employment of labor in these industries as "equivalent to the appointment of officers and the enlistment of soldiers and sailors in military service."[38] Others doubtless agree with Mr. Chief Justice Taft that "it requires a more drastic exercise of control to impose limitations of continuity growing out of the public character of the business upon the employee than upon the employer,"[39] but still differ widely in the exact degree of compulsion which they feel necessary. At the opposite pole of thought are those who hold that no greater legal duties should be imposed on public utility employees than on employees in private industries.

Public policy has leaned in the direction of the same freedom of contract in utility labor relations as in other classes of labor relations. There are some exceptions to this policy. State laws penalizing railroad crews for abandonment of trains before reaching terminals have been passed and sustained.[40] A succession of mediation and arbitration statutes applying to railroads have set up governmental boards with varying powers over labor disputes.[41] Colorado has a compulsory investigation act applying to utilities as well as to other industries and Kansas has a now quiescent compulsory arbitration statute covering all businesses effected with a public interest.[42] In addition, some state public utility commissions have been accepted as arbitration boards by agreement of the parties.[43] For the most part, however, the public policy has been one of "hands off," recognizing that willing service is more likely to lead to efficient performance.

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[38] *Charles Wolff Packing Co.* v. *Court of Industrial Relations*, 262 U. S. 522 (1923).

[39] *Ibid.*

[40] As was said by the court in the early Toledo case, "An engineer and fireman, who start from Toledo with a train of cars filled with passengers destined for Cleveland, begin that journey under contract to drive their engine and draw the cars to the destination agreed upon. Will it be claimed that this engineer and fireman could quit their employment when the train is part way on its route, and abandon it at some point where the lives of the passengers would be imperiled, and the safety of the property jeopardized? The simple statement of the proposition carries its own condemnation with it." *Toledo, Ann Arbor & North Michigan Ry. Co.* v. *Pennsylvania Co.*, 54 Fed. 746, 752-753 (1893).

[41] A convenient summary of these laws may be found in A. R. Ellingwood, "The Railway Labor Act of 1926," *Journal of Political Economy*, XXXVI (Feb., 1928), 53.

With the exceptions noted, this laissez-faire policy has withstood repeated attempts to enact compulsory arbitration for transport utility employees. Those who urge the prohibition of strikes on public utilities usually rely on three chief arguments: (1) since continuous operation of these industries is essential to the general public, the collective withdrawal of labor is a strike against consumers more than against the immediate employer; (2) since utilities must serve all who come indiscriminately and may not abandon service without prior permission of the proper public officials, laborers in electing employment by a utility become subject to the same obligations; (3) since the revenues of the utility and the return to the stockholders are controlled by public agencies, it is both logical and fair that wages which form the chief item of operating expense should be similarly controlled.

Against these views, organized labor strenuously insists that the strike weapon, even when used sparingly, is essential to insure equality of bargaining power with organized employers. If one workman quits or is discharged, he loses for the time being 100 per cent of his earning power, whereas the employer loses only 1/100th or 1/1000th, as the case may be, of his labor force, which may be easily replaced. The collective quitting of work, on the other hand, equalizes the struggle by withdrawing 100 per cent of the employer's labor force and persuading others not to "scab." Or the union argument may take this form: The right to organize, bargain collectively, and quit work collectively is part of the liberty of contract guaranteed by the Constitution and compulsory arbitration would abridge that liberty. The strongest argument against compulsory arbitration, however, is that it is unworkable. English judges long ago learned the folly of trying to compel specific performance of personal service. It is difficult to see how an arbitration board, possessing powers of compulsion, would be differently situated. As long as we cannot divorce the services of labor from the person of the laborer, the use of compulsion in labor relations will prove less efficient and economical than persuasive inducements.

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[42] There is an almost voluminous literature dealing with the Kansas Industrial Court Act. Among the most recent and best discussions of the Act is Edward Berman, "The Supreme Court and Compulsory Arbitration," *American Economic Review*, XVIII (March, 1928), 19.

[43] See *Green* v. *Indianapolis Street-Ry. Co.*, No. 8855, Mo. P.S.C., May 20, 1927; P.U.R. 1927-D, 607.

This policy has left the field open for experiments with various substitutes for legal compulsion in the adjustment of labor relations. The result has been a variety of experiments as wide in scope as local conditions, personalities involved, and the examples of the other enterprises warrant.

These experiments fall naturally into two groups: Those that are based on recognition of, and dealings with, independent trade unions and those based on individual bargaining or collective dealing with so-called ''inside'' or ''company'' unions. There is, however, another less objective principle of classification. This principle can best be described as industrial citizenship. Effective recognition of collective bargaining implicitly treats workers as citizens of the industry having rights akin to property in their jobs. The opposing view, though not always appearing in undiluted form, is, badly stated, that workers are wards of industry having more privileges than rights in their jobs.

Collective bargaining in its true sense of negotiation between company officials and union officials who are independently chosen and paid by organized workers is comparatively widespread in the transport utilities, both steam and electric. Among telephone, telegraph, gas and electric utilities the illustrations of collective bargaining are relatively scattered.[44]

A noteworthy contrast is found when collective bargaining on the railroads and electric railways is compared. The trade union on the latter utility is industrial in form, claiming jurisdiction over motormen, conductors, and all other occupations regularly compassed in street-railway operations. On the steam railways, however, the unions are organized on the craft basis, with the organizations of transportation men generally accounted the strongest.[45] To this different basis of organization may be attributed differences in the psychology and tactics of negotiation of the street-railway union and the railroad brotherhoods. The industrial union, on the whole, is less likely to seek advantages at the expense of weaker groups in the industry, whereas some craft unions are able, and appear not averse, to gain material benefits at the expense of weaker unions. Attitudes toward arbitration likewise tend to differ. Members of the industrial union may use arbitration as a concession in bargaining whereas the weaker craft union uses arbitration as a step to recognition or a substitute for bargaining which it lacks cohesion and strength to compel.[46]

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[44] It is not unusual for the same company to refuse recognition to a union of workers in one department and to recognize and deal with workers doing the same work in another department or another part of the territory served. Illustrations are found of agreements with electrical workers doing outside construction work, while inside electricians are dealt with individually or through a "company union."

[45] The four transportation brotherhoods are not affiliated with the American Federation of Labor. Practically all the shop craft unions are so affiliated. They have achieved some of the advantages of the industrial form of organization in federating for certain purposes in the Railway Employees Department of the A. F. of L.

The focus of orthodox collective bargaining is the trade agreement, which, as an instrument of industrial government, forms the constitution or sets the standards according to which individual employment contracts are supposed to conform. In the collective agreement are set forth those customs and practices which the negotiating parties agree shall apply to day-to-day individual relations during the life of the agreement. Too frequently, however, especially in weaker craft unions which lack vigilant leaders, the administration of trade agreements is ineffective.

Since the War the old-style trade agreement has undergone some adaptation in an endeavor by the unions to meet the challenge of ''company unionism.''[47] Union-management coöperative agreements represent bargaining based more on a psychology of mutual helpfulness than on the psychology of armed truces, although recognition of, and continuous dealing with, trade union representatives is an integral part of the altered policy. The danger is that these worthwhile experiments may be undermined by managerial greed or ''hold-up'' bargaining by the unions directly involved, or by the parasitic bargaining of unions not parties to such coöperative arrangements. Viewing public utility labor relations as a whole, the union-management coöperative movement appears to mark a drawing together, in form if not in substance, of the rival forms of industrial representation.

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[46] See J. G. Luhrsen, "Time Has Come to Seek Railway Labor Law That Will Have Provisions Enforcible in Court," *The Train Dispatcher*, X (July, 1928), 423. See also Report of Committee on Commerce of American Bar Association, *Proceedings*, 1928.

[47] No attempt is here made to argue the pros and cons or the merits of the controversy now raging between the unions and the proponents of "company unions." See Seager, "Company Unions versus Trade Unions," *American Economic Review*, XIII (March, 1923), 1. The major point of dialectic difference between the two schools of thought is whether public utility managements should bargain with workers' representatives who are or are not also employed in the industry. The real difference is the more deep-seated one of a fundamental clash of economic interests and of views as to the laborer's position in industry and rights in his job.

Considered broadly, approximately half of the wage-earners employed by public utilities work under the policy best described as individual bargaining or collective dealing, as distinguished from collective bargaining. Some of the detailed practices which make up this general type of policy are found even among companies which accept the collective bargaining principle, but these instances serve to make the contrast clearer.[48]

Without reviewing the details of the managerial policies, they may be grouped under two general headings: (1) the recruiting of a labor force; (2) inducing efficient and continuous service. Under the first heading come those activities commonly labeled employment management, which includes getting, examining and selecting applicants; training applicants for their jobs; promoting and transferring employees according to demands of the service, the capabilities of workers, or seniority in service with the company. Under the second grouping come those activities normally within the industrial relations department. These also are ordinarily of two types: (1) restraints to maintain discipline through shop rules, such as employee representation plans; (2) encouragements to increase efficiency, reduce turnover, and generally stabilize the labor force. Where collective bargaining with an outside union is not the policy, most of these activities are carried on through an employee representation plan for the adjustment of wages and disputes regarding discipline and an employees' benefit association for the administration of savings, insurance, and pension funds, loan funds, and recreational activities. Through the latter agency the utility affords the means, sometimes contributory, sometimes on a gratuity basis, of financing the chief hazards of a worker's life; namely, interrupted earnings due to sickness, accident, death, old age, and in rare cases unemployment. All these detailed managerial policies may be summarized in the statement that their underlying purpose is to substitute for legal compulsion the moral obligations and pecuniary advantages of loyal, continuous, and efficient service to the company; they constitute the means whereby management induces employees to recognize and assist it to meet *its* obligations to consumers.

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[48] Although some of these practices, like employment management, do not conflict, except perhaps indirectly, with the interests and activities of union members, other policies, such as insurance, stock ownership, pensions, are designed to, or may tend to, undermine the loyalty of union members to their organizations.

From this standpoint the managers of utilities might be said to act as joint agents of owners and consumers in dealings with their employees. Taking this view, equitable labor relations become one of the obligations of management to consumers, and the latter through their representatives are in a measure responsible for fair treatment of labor. Where the interests of owners and consumers clash, however, the joint responsibility of management tends to give way to the single responsibility to owners. This is the feature of utility labor relations that at bottom has produced most difficulties. From the public standpoint, a frank and unwavering adherence to the attitude that management has joint responsibilities in labor relations is much to be desired. Were managements sincerely and honestly to adopt this point of view, the tension, hostility and under-cover distrust that characterize the industrial relations of many utilities would be greatly reduced.

In concluding this survey of the more or less distinctive features of labor relations on utilities, as these are related to technological, marketing, and social considerations, two matters need reëmphasis. First, the distinctions noted are for the most part differences in degree, more than in kind. We find that labor bargaining in the utility field presents much the same range of problems as in private industries. But some of these problems are more acute in the utilities because of the nature of these industries as a class. Second, significant differences may be summarized as the mental attitudes of the parties to the labor bargain. Attitudes of mind are not as ephemeral and intangible as the phrase indicates. They are the roots of human behavior. Observed differences in behavior of employers and employees in utility industries, compared with purely private enterprises, necessitate policies that take account of these differences. The peculiar blending of compulsion and freedom which colors all the economic relations through which public utility services are rendered produce no less important effects on labor relations than on relations with consumers, investors and other economic groups. Against this background the conduct of utility employers and employees needs more study than it has yet received.

101. Seasonal Employment of Public Utility Labor *

Chart 57

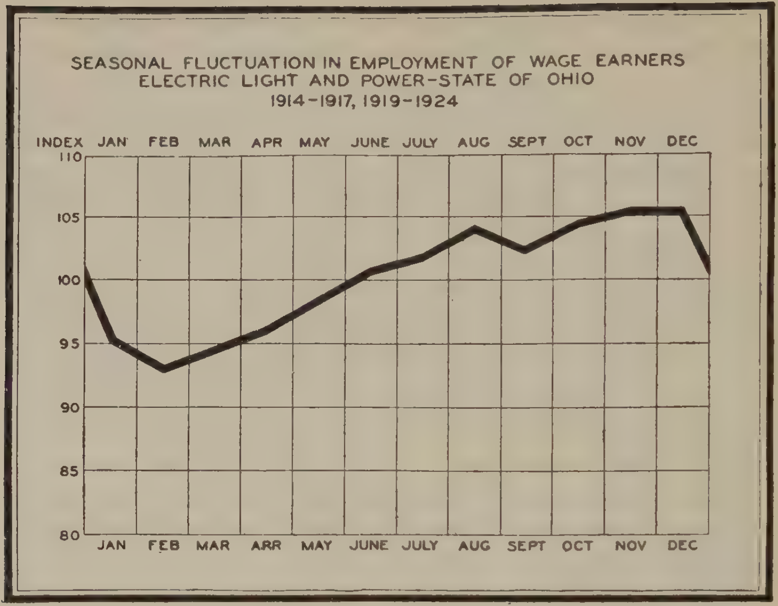
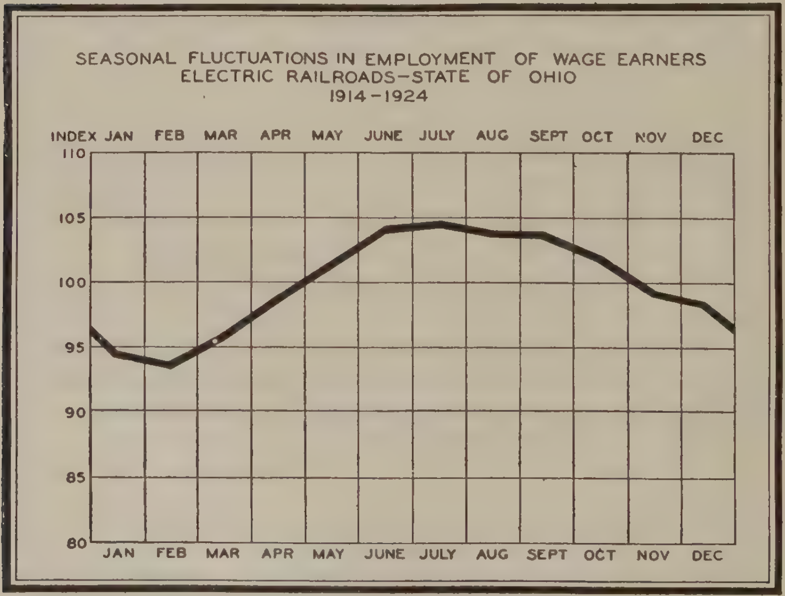


Chart 58



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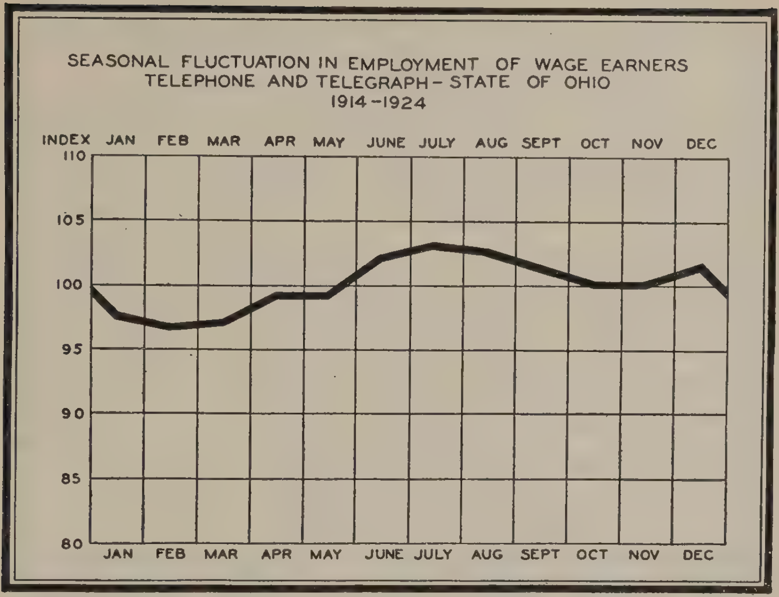
* Ralph J. Watkins, *Ohio Employment Studies*, No. 7, Bureau of Business Research Monographs (Columbus: Ohio State University Press, 1927), Charts XXVII, XXVIII, and XXX, pp. 20-22.

Chart 59



102. Company Unions Versus Trade Unions *

It is my purpose to consider the advantages and disadvantages of these two types of labor organizations, company unions and trade unions, from the viewpoint of the public interest, the interest of the employees, and the interest of employers. Our experience with company unions is so recent that any discussion of them must be in part speculative. To make my treatment as definite as the nature of the problem permits, I shall limit myself to this issue in relation to public service industries. . . .

Public service industries may, for the purpose of this discussion, be defined as industries whose continuous operation is vital to the public interest. Such for illustration are local public utilities, street-railways and steam railroads.

Because the continuous operation of these industries is of vital public concern we are beginning to develop a special public policy toward them designed to insure uninterrupted service. This has been the objective of our gradually unfolding railroad labor policy. In order to judge which form of labor organization

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* Excerpts, Henry R. Seager, *American Economic Review*, XIII (March, 1923), 9-13.

is best adapted to such industries, we must consider the direction in which this policy is carrying us and its probable consequences.

(The writer then cites as evidence of "the inevitable trend of governmental policy toward labor controversies on public service industries," the various Congressional Acts from 1898 to 1920 dealing with the adjustment of railway disputes, the Kansas Industrial Court Act of 1920, and the recommendation of President Harding that railway strikes be prohibited and the Interstate Commerce Commission be given powers of compulsory arbitration.)

It would be a bold prophet who would attempt to predict just what developments in our governmental policy toward public service industries lie immediately before us. . . . But I venture the opinion that whatever course the legislation of the immediate future may take, the logic of the situation will as time goes on lead us to strengthen rather than weaken the machinery for insuring continuous operation of public service industries. This means the maintenance of an authoritative board or court to determine labor conditions on the railroads and of similar state boards or courts to determine conditions on street-railways and other local public service industries. It means the formulation in statutes of the standards as regards wages and working conditions that are to be required in connection with public service industries. Finally it means prohibition with enforceable penalties (not imprisonment[1] but fines which pursue the offender until paid, as in New Zealand) of strikes or other concerted efforts to interrupt the service. I base this opinion on two grounds. In the first place the strike weapon in these industries is beginning to be a boomerang. The very fact that continuous operation of public service industries *is* vital to the public interest insures in advance public condemnation of the group which undertakes to interrupt such operation, however great the provocation. . . .

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[1] Among such conflicting testimony, there seems to be general agreement that a chief reason for the violent reaction against the Kansas law in the recent election was the severity of the penalties imposed under it. Sending Alexander Howat and his five associates to jail made the law seem obnoxious even to wage-earners who had theretofore viewed it with indifference or even approval. Fines, collectible from the future pay envelopes of employees violating the law as well as from union treasuries, would prove in the long run a more efficacious means of enforcement.

The application of this new state policy to coal mining, an industry which had long been nationally organized both on the managerial and the labor side, subjected it in my judgment to an unfair test. Had its operation been limited to street-railways and other local public service industries, it might soon have been accepted as a logical and proper extension of the policy which had already been undertaken, of regulating these industries through a public service commission.

My second and stronger reason . . . is that we have already pressed the policy of regulating rates and quality of service so far that we cannot well avoid similarly regulating wages. Public authority cannot long content itself with prescribing that "rates shall be fair and reasonable" without also prescribing that costs, including wages, shall be fair and reasonable.

The background against which we must consider the advantages and disadvantages of company unions *versus* trade unions in public service industries is then a situation in which the strike is already a discredited and is rapidly becoming a futile weapon, in which boards and courts are being established and strengthened to adjudicate labor disputes, in which definite standards as to hours, wages, and working conditions are being crystallized into law, and in which to an increasing extent the law will also prohibit and punish combined action aiming at interruption of the operation of these industries.[2]

We are now ready to ask what are the tests of a desirable form of labor organization from the viewpoint of the public, of the employees concerned, and of the employers. From the viewpoint of the public the ends to be advanced are continuous operation, economy and efficiency in operation; and the development of more intelligent, more capable and more public-spirited workers and citizens. From the viewpoint of employees economy and efficiency in operation and the development of a higher type of worker must be stressed, but even more important are liberal compensation, moderate hours, safe and sanitary working conditions and the fullest participation by the workers in the determination of their working conditions that is compatible with economy and efficiency. Finally from the viewpoint of employers the desiderata are continuous operation, maximum economy and efficiency, low labor costs, and ready acceptance by the employees of changes deemed by the management to be necessary to the good of the business.

Economy and efficiency of operation are desirable ends to the public, to employees and to employers. Which type of organiza-

[2] I do not advocate this last step, logical and necessary as I believe it to be, because I feel strongly that any statute which deprives the employees of public service industries of their right to strike, must in fairness establish definite minimum standards for their protection. Among these should be, in my opinion, the eight-hour day with extra compensation for overtime, a reasonable living wage, employment on a monthly or even annual, instead of merely a daily, basis and the right to belong to labor organizations of their own choosing. . . .

tion, company unions or trade unions, is likely to contribute the more to economical and efficient operation? There can be little question that judged by this test company unions are superior. Limited in membership to the employees of the business organization which they serve, they readily develop an interest in and a loyalty to that organization which tend to increased efficiency. Since the questions discussed and the conditions to be regulated all relate to the one organization, the employee representatives, and through them the rank and file, soon acquire a knowledge of the production problems with which the employer is struggling, realize their community of interest with him in solving these problems successfully and develop that coöperative attitude that is bound to follow from such realization.

By contrast trade unions, including in their membership employees not of one organization only but of as many competing organizations throughout the country as can be induced to join, inevitably stress the opposition of interest between their members and the business organizations they serve. The very reason for their existence is the conviction that the interests of employers and employees are opposed. It is not by promoting economy and efficiency that they hope to benefit their members but by bringing organized pressure to bear upon the employers. . . .

Individually they [trade union officials] are often, if not usually, fully aware of the coöperative aspect of the relationship between employers and employees and alive to the dependence of favorable conditions for their constituents upon efficient and economical production. But the very form of the organizations which they represent precludes them from being as coöperative in their practical attitude as the representatives of company unions. Since they deal with many competing employers, some considerate of their employees, some hard-faced exploiters, they necessarily conceive of the interests they represent as on the whole opposed to the interests of the employer and deem it their principal business to force employers, through the pressure that organization enables them to exert, to grant more favorable conditions than these would voluntarily concede.

It requires no argument to prove that company unions are likewise more conducive than trade unions to the continuous operation of the industries with which their members are connected. When not pledged by their constitutions to refrain from strikes, as are many of the railroad company unions recently organized, they are deterred from such activities by the lack of outside support.

While the evidence thus favors the company union as the better agency for promoting economy and efficiency and continuity of operation, the argument seems all on the side of the trade union from the viewpoint of the employees' chief interests—favorable wages, hours, working conditions, and participation in determining these conditions. The company union is obviously not equipped to contend effectively for better conditions with a reluctant employer. In the first place, all the members, including even the officials of the organization, are employees of the employer to be influenced and dependent upon his good will for a livelihood. Second, because of their local character they are debarred from acquiring knowledge of conditions in other establishments where perhaps wages, hours, and working arrangements are more favorable and thus are unable to exert the pressure which possession of this knowledge would make possible. In the third place, again because of their local character, they can offer no effective resistance to adverse changes initiated by the employer, since without outside support they can do little more than protest against what they consider unfair.

The trade union enjoys obvious advantages at all three points. Its officers and most of its members are independent of any individual establishment or company and therefore can more aggressively press for desirable changes. Second, its officers are in contact with conditions in the given industry throughout the country and able to use this broader knowledge effectively in connection with any local controversy that may arise. Third, knowledge that his employees have their trade union behind them serves to deter the employer from initiating unfavorable changes, and when he does attempt such changes the members immediately affected can resist much more vigorously because of the support of the membership at large on which they can usually count.

For all these reasons trade unions promise greater benefits to their members than company unions, but there is another side that must not be entirely overlooked. Overemphasis of the struggle aspect may result in so hampering production that the larger share of the smaller output that employees secure leaves them worse off than the smaller share of the larger output that might have gone to them had they been without such powerful organizations. . . .

Only when the standard conditions secured through trade union bargaining are free from wasteful and hampering restrictions, such as would not and could not be exacted by company unions, is the case entirely in their favor even as regards wages, hours, and working conditions.

The superiority of the company over the trade union as regards low labor costs and the "ready acceptance by the employees of changes deemed by the management to be necessary to the good of the business," the principal desiderata of employers, is obvious from the very nature of the two organizations. Closer contact with and better understanding of the production problems of the establishments they serve make the officers and members of company unions much more open-minded with reference to proposed changes than the officials of trade unions can be expected to be. This difference is registered in the frequent complaint of employers that the trade unions try to run their business and the countercharge of trade union leaders that company unions (to quote from the American Federation of Labor resolution on the subject) are "a snare set up by the companies for the express purpose of deluding workers into the belief that they have some protection" when in reality they have none.

How is the issue affected in the case of public service industries when, in the interest of continuous operation, the law prescribes standards as to wages, hours, and working conditions that must be maintained; creates boards or courts for enforcing these standards, and prohibits the organized workers from joining in strikes to interrupt the continuous flow of the commodities or services vital to the public interest? It is evident at once that prohibitions on the right to strike largely neutralize the advantages which flow from trade union organization. Realization of this fact goes far to explain the uncompromising hostility of the officials of the American trade unions to any curtailment of the right to strike. Officers of the railroad brotherhoods have long realized that actual use of the strike weapon would arouse such a storm of public disapproval that the strike would be bound to fail and yet they insist on a retention of the nominal right to strike because they realize how its withdrawal will weaken the force of their efforts to maintain the full strength of their unions. . . .

The case for organization into company unions can be presented with convincing force by a . . . traction company which really wishes to establish better relations with its employees and through their intelligent coöperation to afford more economical and efficient service to the . . . public. Through their joint efforts the employees organized in a company union can improve greatly both the safety and the efficiency of the service. If the employer couples with intelligent encouragement of the company union considerate plans for enabling the employees to acquire stock in the corporation, for profit-sharing, and for insurance against illness, unemployment and dependent old age, he can readily make any promised benefits of the national trade union seem hollow and unreal and develop an *esprit de corps* among his employees that will react not only to his advantage but to their advantage and to the advantage of the public—providing always that just and reasonable standards as to wages and hours are maintained by public authority.

The case is not so clear in connection with the operating departments of the railroads. Here the employees are scattered over a wider territory, standards as to wages, hours, etc., must approximate uniformity on different roads at least in the same district and there are other circumstances favoring national organizations. As we persist, however, in the policy on which we have embarked of prescribing by law standards for railroad employees, of maintaining a government board to enforce these standards, and of limiting the right to strike, steam railway employees . . . must feel less strongly the urge to maintain their national organizations and must become more alive to the advantages of more coöperative relations with the employing companies.

All of the advantages of both forms of organization might be secured, if railroad executives would continue to settle questions of wages, etc., by negotiation with the brotherhoods; and on their side the brotherhoods would coöperate in the organization of their members into company units for promoting safety, efficiency, and economy on their respective roads and for adjusting local differences locally.[3] . . .

I have reserved for final consideration the aspect that is after all of chief concern to economists—which form of organization, company unions or trade unions, is likely to lead in the long run to the development of the "more intelligent, more capable and more public-spirited workers and citizens"? To answer this question it is necessary to have in mind some ideal as to the goal toward which our industrial development is leading. The ideal which commends itself to my own mind is an industrial society in which the average level of intelligence and understanding is continuously rising, in which the ownership of capital is becoming more and more widely diffused and in which the workers are progressively better paid for more congenial work varied by more ample opportunities for leisure and recreation. With an increase in average intelligence I venture also to hope that there may be such improvements in our political organization that public service industries may be more commonly not only owned but efficiently operated by the government for the common benefit, that coöperative enterprises may become more numerous and more habitually successful, and that the employees who continue to work for profit-seeking employers may be given a progressively larger voice in the determination of the conditions under which they work and may be insured a reasonable share in the profits they help to earn for such employers.

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[3] As regards competitive industries, where the conditions make the maintenance of trade or industrial unions of national scope desirable, some such combination of the unions with shop committees or "works councils" has many advantages for all concerned.

Toward the realization of this ideal, American trade unions have made a contribution of inestimable value. Without them the struggle between employers and employees would have been so unequal that the wage system all along the line might have become, what it still is at its worst, another name for the sweating system, and the gulf that separates employers and employees might have been so widened that the proposal to bridge it would have seemed chimerical. In their work of fostering the independence and raising the standards of wage-earners, trade unions have necessarily developed as fighting organizations. They have constantly stressed the opposition of interest between employers and employees and the strike has been their most effective weapon. If my analysis is correct we have now reached a stage in public service industries where we can no longer tolerate the use of the strike and where we are beginning to establish standards through legislation and through adjustment boards which render resort to it unnecessary.

Is the company union or the trade union best fitted for the further development of the employee in public service industries as a worker and as a citizen? Certainly many of the company unions that have been launched in the last few years have little to commend them as schools of efficiency or of forceful citizenship. They have been imposed on reluctant employees by employers whose chief motive was to discourage by this means all other forms of organization, a purpose which has been frankly manifested in rules that on the one hand require the employee to belong to the company union and on the other to forswear allegiance to any and every other form of labor organization.

But along with these trade-union-smashing company unions are others which put no limitations upon the right of the employee to belong to other organizations but yet offer him so much more than the fighting trade union can hope to offer him that they easily attract and hold the great majority of the employees.

The limitation of the old-line trade union is that it is designed to strengthen the power of its members to fight the exploiting type of employer. When confronted by an employer who is really actuated by good will toward his employees and is capable of organizing his business so as to offer them better conditions than most of his competitors, the trade union becomes in great measure superfluous. On the other hand with such an employer a company union can be developed into a powerful agency for raising the level of intelligence and understanding of the employees, for according them a larger and larger share in determining the conditions under which they shall work and in preparing the way for that better industrial world which we like to believe is in process of becoming.

The choice between the company union and the trade union as regards this vital question as to which will develop the better worker and citizen thus depends on the type of employer who as time goes on is to manage our public service industries. So long as the profit-seeking exploiter type predominates, our preference must be unqualifiedly for the fighting trade union. As the coöperative employer who honestly regards himself as the senior partner in industry and his employees as his junior partners becomes predominant there will be less need for the fighting trade union and a larger field of usefulness for the company union, as a step toward true copartnership in industry. . . .

There is one aspect of the situation which this analysis seems to overlook. Consciousness of the opposition of interests between employers and employees has given vitality to the trade union, but an even stronger cohesive influence has been the consciousness of common interests that is causing the workers of all countries to unite even across national boundaries. Is this growing sense of solidarity to be eclipsed by the increasing realization fostered by company unions that employers and employees have common interests as well as conflicting interests? Nothing is further from my own expectation. What I think rather is that the sense of common interests which holds wage-earners together in trade unions will be in part transferred from the industrial to the political field. The principal circumstance that may render the trade union less indispensable is not any over-night conversion of employers, but the taking over of the regulation of working conditions in public service industries by the government. In the constitution of adjustment boards, in the formulation of legal standards as to working conditions, in the progressive development of social insurance and other protective labor legislation, wage-earners will have an ever increasing motive for concerning themselves with politics. . . .

There is danger that the consciousness of solidarity of interest among wage-earners will grow weaker so long as the wage system itself endures. What we must hope for from the changes which I have forecast in connection with our public service industries, and this is my last word, is that this consciousness of solidarity may be tempered by a growing realization of our common interest in having these industries really dominated by the motive of public service, rather than by greed for excessive profits on the part of the employer or desire for unfair advantages on the part of the employee.

103. Some Limitations and Problems of Public Utility Labor Disputes *

. . . In the field of public utilities this subject [arbitration of labor disputes] is especially significant because of consumers' dependence on uninterrupted service. Thus a legal duty to give continuous service to consumers has been imposed on utilities. Do employees of the utilities have the same duty? This is a much disputed question. At the hearings on the Watson-Parker [1] bill it was debated very earnestly and vehemently and it crops up as soon as difficulties in labor relations in the utilities appear on the horizon. Some people sincerely believe that the public's dependence on continuous service creates a duty to refrain from strikes. Others equally sincere, claim that the workers have a superior right to quit work individually or collectively and that this right (really a privilege) is guaranteed by the Constitution. . . .

Whatever may be the justification for using the strike privilege in a given situation, the feeling is wide-spread that on public utilities the justification must be stronger than is ordinarily the case. This is not alone a matter of "public right"; it is also good tactics. The patrons of utilities because of their dependence

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* Excerpts, Edward W. Morehouse, *Journal of Land and Public Utility Economics*, III (1927), 77-85.

[1] Sixty-ninth Congress, Act 257 (May 20, 1926).

will be aroused more quickly and will give more attention to a stoppage of an essential service than to a strike in which consumers' interests are more remote. The possibility that a costly strike will lead to a demand for increased rates of service is an added reason for a rather keen public interest in ways and means of avoiding stoppages[2]. . . .

To give to third parties the task of deciding issues which, if undecided, will lead to a strike has not often been really successful. How can arbitration be made more effective?

I am aware that this statement of the ineffectiveness of arbitration will meet dissent. But the objections will come largely from those who picture arbitration as the judicial method of meting out justice to labor and capital. They look upon adjudication as a means of substituting cool-headedness for passions and prejudices. The result is an imitation of judicial forms, technique, and atmosphere.

This idea of arbitration, if carried too far, seems to me misleading because it tends to minimize or overlook two fundamentals: (1) the complexity of labor disputes; (2) the distinction between the legislative and judicial functions.

Too often we think of labor disputes in purely economic terms. It is true that the majority of disputes center about economic differences. Labor's share of the income of the enterprise (the wage issue) is ordinarily foremost in the list of grievances, followed by hours, conditions of work, and so on. But psychological, ethical, and political issues, which frequently do not show up in statistics or even in a list of grievances, are also involved in practically all disputes. Sometimes the dispute starts from one individual's feeling of discrimination about a relatively trivial matter; the feeling spreads until it ripens into a mass movement which, under the influence of a dominant, energetic personality, becomes a concerted movement towards larger ends, though the minor grievances still remain part of the dispute. A mistake occurs when we oversimplify these diverse emotional, political, and economic elements and attempt to classify all disputes into one or a few types.

Can a third party, a stranger to these emotions, ever mete out justice?[3] If the arbitrator remains aloof and indifferent to these elements, he does not get to the heart of the dispute. If he enters into these feelings, he exposes himself to charges of favoritism. Moreover, in a mass movement the intensity of feeling varies from individual to individual. On the employer's side this problem is less acute because of the fewer individuals involved. Is it possible to frame an award applying to a large number of people which will meet all the varying individual standards of equity and fair dealing? [4]

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[2] Whether the recent growth of customer ownership of utility securities has increased the sensitiveness of the public to the strike problem is a moot question. Theoretically, an affirmative answer can be amply supported.

[3] See William L. Huggins, *Labor and Democracy* (New York, The Macmillan Company, 1922), p. 47, for an attempted distinction between "arbitration" and "adjudication"; and *State* v. *Howat*, 109 Kan. 376 (1921).

This difficulty, arising from the nature of labor disputes, leads directly into the problem of jurisdiction. What kinds of questions are arbitrable? The answer depends on the distinction between legislative and judicial functions. . . .

Arbitration boards and the courts exercise a similar blending of legislative and judicial functions, with the emphasis on legislative functions in arbitration cases. In most instances, particularly on public utilities, arbitration is a last resort to avert the crisis of a strike. The board is called upon to make an award affecting a large number of workers, stockholders, investors, and consumers; to deal with future conduct; and to define the rights, duties, and privileges of workers and others. The judgment of a third party fixes basic industrial policies in which great interests are at stake. Wage policies, hours of work, standards of living, sometimes the demand for union recognition—all these issues, complicated by emotions and industrial politics—form legislative questions. Are they arbitrable? [5] If they are, how can an arbitrator deal with them most effectively?

The way out of such group conflicts is ordinarily by direct negotiation, by bargaining, which is the legislative method. But when negotiation has failed, and an arbitrator is called in, it is not unnatural for him to feel that an award has to be made, if only to protect a dependent public. This reaction is especially likely if arbitration is merely temporary and the board ceases to exist when the emergency is over. The danger lies in not distinguishing legislative and judicial questions, for, as the courts have found, identical treatment for both classes of questions leads to unsatisfactory results. Much of the unpopularity of arbitration in the past has been due to arbitrators who, in identifying the arbitral and purely judicial functions, have used the same technique for both legislative and judicial questions.[6]

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[4] See, for example, the valuable appraisal of the Kansas Court by Herbert Feis, "The Kansas Court of Industrial Relations, Its Spokesmen, Its Record," *Quarterly Journal of Economics*, XXXVII (August, 1923), 705.

[5] American *political* traditions generally are against giving wide powers over others to a few men; American *industrial* traditions tend the other way. In politics, when courts have drastically checked legislative action, sooner or later a popular protest movement has sprung up. Industry is not without similar experiences in the history of labor organizations.

Perhaps this is inevitable as long as "crisis" arbitration is customary, although a somewhat different procedure is possible and will be suggested later. But the best chance of solving the vital problem of what is properly arbitrable occurs when arbitration is continuous rather than temporary, and is accompanied by continuous negotiation between responsible and clear-visioned representatives. With such an arrangement it is possible to give piecemeal consideration to issues which are lumped together when emergency boards are created. Thus the strain on arbitration machinery is lessened because legislative questions, which should be matters of agreement between employers and employees, can be segregated and thrown back to the negotiators.

This type of arbitration has been developed to its fullest extent in the clothing industry. It is a contribution to the theory and practice of arbitration which is best described in the words of one of the parties:

> Many reasons have been given for the peculiar success of arbitration in this industry and, no doubt, all have more or less strength. The men attracted to the office of impartial chairman have been uniformly of high character and marked ability. The fact that arbitration has been a continuous operation, not invoked occasionally to avert a crisis, has contributed to confer on the arbitrators a technical proficiency in the problems of the industry which a short, interrupted tenure cannot yield. Moreover, continuity has bred familiarity and the ease and confidence that often accompany the familiar; so that all parties have come by a gradual process of use to resort to the machinery of arbitration almost as a matter of habit.
>
> Fundamentally, however, the causes of success lie deeper. They reside in the flexibility of arbitration as it is practiced in the clothing industry and in the attitude toward it of the two parties to the collective bargain, the union and the manufacturers. The great burdens of critical decision have rarely, if ever, been imposed on the arbitrator. Both the union and the manufacturers have always realized that the ultimate responsibility for the safe conduct of the industry rested upon them. It is a responsibility so serious that they could shift it only at their peril. If a crisis in the industry required drastic action on one side or the other, it was far better for either side to accept responsibility for that action and not shift it to the machinery of arbitration.. . .
>
> The impartial chairman remains the indispensable mediator; he decides hundreds of cases involving practices, procedure, and understandings, that contain within them the germs of serious misunder-

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[6] This was one of the causes of the failure of the Railroad Labor Board.

> standings; he is the trusted and expert finder of facts in the industry; he performs an administrative function of immense value by hastening the settlement of disputed issues; but he is not the oracular judge who can make for the union and the industry those decisions on basic policy which they are so frequently in American industry unwilling to make for themselves.[7]

By way of contrast, experience with standing arbitration boards having *general* jurisdiction has not been a uniform success. Many reasons can be found for the unpopularity of the late Railroad Labor Board. The fact that the board had general jurisdiction which brought both disputed facts and disputed policies before it is one reason. It was also the fate of the board to be called upon early to formulate a vital policy of deflation. In addition there is a tactical explanation. Weak unions tend to look on arbitration as an opportunity to gain recognition; strong unions believe they can get more without arbitration. Moreover, with permanent boards the parties become able to guess fairly accurately what the decision of the board will be, and this tends to dampen the willingness to arbitrate, even at the risk of public disapproval; for when great issues are at stake, arbitration with uncertain results offers only a gambler's chance of getting more than by bargaining or striking. Finally, the Railroad Labor Board is only one of many illustrations of the importance and difficulty of choosing the right sort of men to handle satisfactorily a complex labor dispute.

A common criticism of arbitration is that the men selected do not know the technical details involved in disputes. The result is frequently an award that is so unfair or so unclear as to breed more disputes. As long as crisis arbitration is the chief reliance, the parties must take the risk of an uninformed arbitrator. However, it is believed that this risk might be reduced if more study and attention were given to the mental equipment necessary for dealing with the various kinds of disputes. Two often the standard of choice seems to be prestige in the community or supposed bias toward one side or the other. These qualifications are no guaranty that the situation will be dealt with in the most effective manner, for some men are equipped to arbitrate only certain kinds of disputes or certain areas of a given dispute.

From reading a number of awards and from observation, I would roughly classify arbitrators into four types. First of all, there is the legalist. He is an objective person, not interested in the psychological aspects of a dispute, and is inclined to depend on logic, precedent, or tradition in reaching a conclusion. He reasons out consequences on the basis of accepted principles. To him, justice is a matter of evidence. Then there is the moralist, the type of person who has emotionalized his opinions about the labor movement and who is likely to be interested primarily in the ethical aspects of a dispute. To him, justice is a matter of social reform. Next comes the bargainer, the product, perhaps, of experience in mediation. This type generally tries first of all to mediate differences. Failing in that, a decision is made according to the balance of economic power, so that the result is approximately the same as would have obtained if both sides had fought it out. To the bargainer, justice is what will work. Finally, there is the arbitrator who may best be described as a realist with a constructive purpose. He is eclectic, tries to determine the emotional as well as the economic and political issues, seeks the technical factors underlying the dispute, considers the evidence of past practices, analyzes the economic principles involved, and in the end tries to build a policy of stable, equitable relations for the future. To the realist with a policy for the future, justice is a matter of building equitable and economic working rules.

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[7] *Report* of General Executive Board of Amalgamated Clothing Workers to 7th Biennial Convention, 1926, pp. 25-27.

Since arbitrators differ in mental equipment for the task, it is as important to fit the arbitrator to the type of dispute as to fit the worker to the job. Otherwise, effective arbitration is endangered in the same way that a misfit worker reduces efficiency.

Yet, even after precautions are taken in the selection of the arbitrator, arbitration may break down on the award. The problem here is to decide which of three principles should be applied. The first principle is that of ‘‘splitting the difference’’; the second is that of balancing the difference; the third may be described as the principle of working rules or stabilization.

Many arbitration awards have been justly condemned because they ‘‘split the difference,’’ or appear to do so. Conclusions of this kind dodge difficulties rather than meet them. The theory back of ‘‘splitting the difference’’ seems to be that arbitration is merely a safety-valve for the emotions, and that an arbitrator cannot possibly determine and weigh all the diverse strands in the dispute. Under these circumstances, it is said, the only thing to do is to make an award midway between the demands of the two parties.

That this principle settles nothing is apparent. It is also a vicious formula from the standpoint of constructive arbitration, for both sides are encouraged to make extreme demands. Possibly, however, a break in relations may be avoided by giving each disputant equal feelings of disappointment. But this can hardly be said to contribute to stable relations in the future.

The "balance the difference" principle is the one used most often by the type of arbitrator previously described as a bargainer. The application of this principle results in an award which is substantially what would have happened if there had been a trial of strength instead of arbitration. It leaves the parties really *in statu quo ante.* Sometimes this method involves the much-abused trick of "giving the language to one side and the verdict to the other." Clearly the principle is based on the theory that arbitration is merely a temporary substitute for negotiation.

Under some circumstances, the use of this bargaining principle is justified, as, for example, when a dispute involves issues of basic policy for which the parties themselves should be responsible. But nothing is gained in the long run by trying to make it appear that a dispute is settled on its merits when in reality an arbitrator has really just weighed the balance of power. The illusion is soon punctured, and resentment at being fooled is a natural result. It would be better to state clearly what has been done and why.

An alternative which merits further experimentation is for the arbitrator to indicate in his award the limits within which he believes future policies should lie and to leave to the disputants the task of making necessary adjustments within those limits. It may be said that such procedure side-steps the issue or shirks a duty. That depends on one's view of the function of an arbitrator. An award that fixes limits is based on the idea that a dispute in which a great deal is at stake cannot be satisfactorily settled by the fiat of a third party.

The third principle, here called the principle of working rules, is especially suited to those disputes, or areas of dispute, in which modification does not mean a radical change of existing policies. The principle is based on what may be called the "going concern" theory of arbitration. According to this theory, relationships between individual employers and workers are seen to be part of a concerted or mass movement toward certain more or less well-defined ends. The outer limits of mass movements of workers, employers, merchants, landlords, bankers, and so on, are found in constitutional and statute law, as interpreted by the courts. Within these limits, individuals and groups of individuals are privileged to act without molestation by public authority; the law is indifferent to what happens. But the extra-legal activity of individuals and groups is itself ordered by certain customs and practices which have grown up out of past experience and are expected to continue in the future. The rules may be written or unwritten. If written, they are found in trade agreements, employee's hand books, lists of shop rules, codes of ethics, corporation charters, orders of public service commissions, and so forth. If unwritten, they may be observed in the customs and usages to which individual employers and workers have conformed in the past. Whether written or unwritten, they are rules of conduct; they enable one to predict how others will act in the future.

An arbitrator who sees his problem in these terms has the task of deciding which of conflicting standards should be sanctioned. Out of the good and bad rules, the arbitrator, like the judge, selects the good, better, or best practices which should guide future behavior. Ordinarily the dominant consideration is what will be the consequences of a different rule. In the case of judicial process, such considerations are called public purpose; in the case of arbitration, they may be called economy, efficiency, industrial stability, goodwill, and so on. Thus the selection of a rule is also the selection of the direction of the end of human relations.

An arbitrator who seeks to work out this conception finds that definite and clear-cut principles are often lacking. It is a field of study that needs more intensive cultivation to uncover tools for arbitrators and managers of labor relations alike. We have, it is true, in the Transportation Act of 1920 a list of seven factors which the Railroad Labor Board was to take into account in fixing wages, and to these the Kansas Industrial Court added another.[8] Various other arbitration boards, both temporary and permanent, in this country as well as in other countries, have experimented with these or different principles, mostly, however, in regard to wage disputes. The elucidation of guiding principles for the protection or conservation of the job, as distinguished from the protection of earnings, is not so well developed.

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[8] *State of Kansas ex rel. Attorney-General and members of Local No.* 841 *of International Brotherhood of Electrical Workers* v. *Topeka Edison Company*, First Annual Report of Court of Industrial Relations, 1920, p. 23.

In all cases, there is great need for more detailed study of the economic effects of applying these principles or others to concrete situations.

Suppose an arbitrator has this attitude of looking at labor disputes as a phase of a concerted or mass movement and also has at his command a good knowledge of working rules and their effects; what shall he do? Probably his attention will be concentrated first on separating the area of dispute into two parts: (1) the issues which involve policies so fundamental that they ought to be determined by the legislative method of negotiation; (2) the issues which have less at stake and which therefore are likely to be solved satisfactorily by a moderate change in working rules. To the first class of issues he will apply the balance-of-difference principle, which, in effect, merely shifts the responsibility for settlement back to the disputants after a period of cooling off. To the second class of issues he will apply the working-rule principle, after determining the facts (which may be disputed or unclear) and the probable economic effects (in terms of efficiency, stability, goodwill, and the like) of sanctioning different working rules.

Though the award be a reasonably good one, there is still the problem of enforcement, the final test of the effectiveness of arbitration. This is especially important in the public utility field because of consumers' dependence on uninterrupted service. Even a good award may be spoiled if antagonism rather than conformity is the outcome of attempts to enforce it.

In general, three types of sanctions may be used. The award may be enforced in a court of law; this is the strongest inducement to obey, since it is backed up by the power of the government. It is also the method advocated by the committee of the American Bar Association. One should note, however, that compulsory enforcement does not mean strictly compulsory arbitration, which occurs when there is a legal obligation both to submit a dispute before striking and to obey an award. A second alternative is to use economic penalties, such as fines, overtime work at straight pay, and so on. A third alternative is to leave enforcement to the good faith of the two parties. Here the inducement is merely the sentiment of moral obligation to keep agreements.

All three degrees of inducements blend into one another, making it difficult to separate them analytically. But a choice must be made. The Railroad Labor Board was limited to the moral inducement, an appeal to public opinion.[9] The Arbitration awards under the Railway Labor Act of 1926 may be enforced by a court order, as was the case in the Kansas Industrial Court Act.

This question of the most effective means of enforcing arbitration awards is many-sided. The complications are of two general types, legal and economic. In view of the Thirteenth Amendment, is it constitutional to enlist the judicial power in enforcing awards? Undoubtedly a stronger case can be made out for legal enforcement of awards in public utility industries than in private industries.[10] But if constitutional diffculties are brushed aside, many practical legal difficulties remain. Are the courts equipped to handle the task?[11] The delay in legal procedure is a very serious obstacle, among others, because timeliness is important when rapid economic changes are involved.

The difficulties in enforcing awards by economic penalties revolve around the question whether persuasion or compulsion in some degree is the better means of getting human beings to do certain things. Generally speaking, we observe that willing workers give more efficient service than coerced workers. It would seem, therefore, that in the long run the best results would come from treating the observance of awards as a matter of good faith, or mutual self-interest. In the case of standing arbitrators with limited jurisdiction, it is possible to secure obedience by minor economic penalties if the workers are organized into a strong, disciplined union, capable of holding members in line. In the absence of such responsible organization, economic penalties for disobedience are likely to cause more illwill than goodwill.

After all, arbitration is no panacea. Its effectiveness in avoiding interruptions of work can be increased if there is a clear understanding of the limitations and problems involved. There is no magic formula for making it successful. Past experience has revealed some of these difficulties; future experimentation, accompanied by a clear sense of realities and group psychology, will, I believe, reveal others. At present the chief difficulty is that too much is expected of arbitrators. Also, the offer and acceptance of arbitration are bargaining points, with the result that it is generally looked upon as a substitute, rather than a supplement, for negotiation. This attitude leads to "crisis" arbitration, which rarely is permanently successful and almost never builds a constructive policy for the future. Even where arbitration is thus used, however, it can function more effectively if arbitrators are fitted to their jobs, if they then separate the legislative from the judicial issues and treat each differently, and if the means of enforcement is adapted to the psychological, economic, and institutional situation with which the award deals. More intelligent negotiation and more realistic arbitration are both needed.

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[9] *Pennsylvania Railroad Company* v. *U. S. Railroad Labor Board*, 261 U.S. 72 (1923).

[10] Cf. *Robertson* v. *Baldwin*, 165 U.S. 275 (1897); *Bailey* v. *Alabama*, 219 U.S. 219 (1911); *Wilson* v. *New*, 243 U.S. 332 (1917); *Wolff Packing Company* v. *Kansas Court of Industrial Relations*, 262 U.S. 522 (1923).

[11] Frequently, temporary arbitration to avert a crisis results in an ambiguous award, requiring subsequent interpretation to avoid further disputes. In such cases, a problem is raised whether to call back the original board, continue the board as permanent, or provide for temporary umpires whose sole function would be to interpret the application of the award to the specific facts. On the whole, experience under the Newlands Act seems to point to the advisability of the umpire or referee method.

For the most part, however, arbitration is better adapted to decisions of disputed facts which do not involve large numbers of people or fundamental policies and to the modification of working rules which lead in the direction of more stable relations in the future. In other words it is adapted to the piecemeal building of a policy and of practices of stabilization, reducing the uncertainties and risks of the future.

104. Labor's Share in Ownership *

The detailed tasks of restoring to American wage-workers a rightful and ingrained sense of sharing in ownership, rest of course with the officers and directors of our industrial enterprises and with the workers themselves. . . . Organizations such as this must frankly instill the realization that there is a social obligation upon us all to provide, not only fair standards of living while working and reasonable protection against the disabilities of old age, sickness, and industrial accidents, but also a conserving sense of ownership and participation in ownership of property and productive enterprise itself.

There is nothing, however, in the general subject of this meeting or in the following discussion which should be considered as advocating the nationalization or equal distribution of property or wealth. On the contrary, I believe that great wealth in the hands of either an individual or a corporation has been one of the nation's greatest blessings. Increasingly, possessors

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* Excerpts Arthur Williams, *Proceedings of the Academy of Political Science*, XI (April, 1925), 6-14 (360-368).

of great wealth give every indication of realizing that because of its possession, they are trustees of human welfare and advancement in many directions. . . . The system we advocate provides that those who now possess wealth shall continue to do so, with an even greater degree of security; and that those who do not own property in some tangible form shall be aided and encouraged to acquire it—but, as before stated, only through their own efforts.

The men and women who work and yet own and possess nothing which they recognize as property—there are still many millions of them in our country—are the most receptive soil for the seeds of discontent and destructive radicalism. Whatever happens—they hear from the professional or political demagogue—can only be to their advantage and that of their families, for they have nothing to lose and everything to gain. . . .

Every faithful worker an owner of property or "every worker a capitalist" may sound like a very startling and radical theory; but, in my judgment, it is a promising cure for social and industrial discontent, and a counter-weight against the extremely destructive tendencies so evident in many directions. As a definite objective, the theory has been adopted by the great Steel Corporation, the Standard Oil Group, the Consolidated Gas and Electric Utility group of New York City; the public utilities, including the railroads, of many sections of the country, and by many other large groups and institutions—again mentioning but a few. . . .

Although I think the development of employee and customer ownership is of even greater importance in the manufacturing industries than in the public utilities, may I divert for a moment to refer to the experience in this relationship of the Consolidated Gas Company of New York and its affiliated gas and electric companies?

In 1922, the trustees of the Consolidated Gas Company decided upon an issue of $15,000,000.00, aggregate par value, participating preferred stock for sale only to employees and customers of that company and its affiliated companies. At that time the company had about 12,173 stockholders, the average holding of each in common stock being about 205 shares.

At the beginning of 1925, the company had more than 60,000 shareholders, about 24,209 being owners of the common stock—an increase of 12,036, almost 100 per cent, in the common stock ownership alone. Employees to the number of 11,345 and consumers numbering 25,844, an aggregate of 37,189, owned the preferred stock. The average holding of each *customer* shareholder is about nine shares of $50 par value; of each *employee* shareholder, about three shares.

Thus of the 26,107 employees of the Consolidated Gas Company and its affiliated organizations no less than 11,345, or 43.45 per cent, are now participants in the ownership of the stock of the parent company. Their dividends, as likewise those of customer owners, increase ratably with the dividend rate on the common stock.

Many of the industrial groups, the banking institutions and public utilities which have sold stock on favorable terms to patrons and employees, have refrained from placing restrictions on the resale and transfer of such stock. They have left their employees and patrons free to determine whether they, for any reason, would retain or sell the stock so acquired. In at least some instances, this has meant that stock subscribed for liberally by employees and patrons has been resold and has thereupon passed into the hands of owners desiring to accumulate it for various purposes.

This was not the policy adopted by the Consolidated Gas Company. In the first place, no employee or customer was or is permitted to acquire and own more than twenty preferred shares, each of a par value of $50. In the second place, no consumer or employee owning shares of this stock was or is permitted to sell and transfer it, except to some other customer or employee not already owning as much as twenty shares. If made salable without restraint, it would quickly be accumulated for investment purposes. The Consolidated Gas Company has steadfastly refused to countenance any such concentration of ownership and this stock remains scattered in the hands of its employees and patrons. . . .

This question of widespread property ownership should be considered from more than the individual or social standpoint. Nations, like individuals, are subject to economic laws. With a large percentage of property-owning workers, it would be obviously to their interest to produce as much and as well as they are able—an industrial condition which would insure the highest degree of perfection at the lowest obtainable cost in both production and distribution. It has been estimated that, in our industries, preventable inefficiency of labor and the breakage of materials represent an average of between 25 and 50 per cent of the production cost. A very small percentage of normal labor costs, used widely by a modern personnel administration, will transform an entire force of slow or discontented workers into an equal number of enthusiastic ''partners'' among whom the service of allies will be substituted for service of employees—the former giving as much as possible; the latter, often, as little as possible.

From a social standpoint, take the difference—no less real because it is not altogether tangible or material—between the social and civic background of the man who is in the property-owning class and that of his fellow worker or neighbor who owns nothing. In each case, consider the resultant sense of security or insecurity which pervades the entire family, from the wife and mother to the children who are today potential factors for good or evil in the future of the nation. . . . A habit of thrift is established, and self-denial, through which property is acquired, leads to as much pleasure and far more permanent happiness than any habit of extravagance or thoughtless living can ensure.

Perhaps the most important item in the list of possible property possessions is a home. Owning a home, acquired with the assistance of a building loan organization or by any other means, gives every member of the family a highly to be desired *esprit de corps,* and a personal and family feeling of social and economic responsibility far beyond anything attainable as tenants of landlords. A feeling which makes for better workers and citizens. . . .

To cite another New York example: About twelve years ago, for the purpose of aiding its employees to secure homes, The New York Edison Company organized a Savings and Loan Association. Its own employees and those of all the affiliated organizations were eligible for membership, subscriptions being deductible by the paymaster on signature to an order stating the amount to be deducted, the company providing the bookkeeping and accounting, and guaranteeing to its employees the safe keeping of their deposits. Since organization, the employees have paid into the treasury $8,767,292.02. . . . To December 31, 1924, 7034 employees have opened accounts in the Association, and 832 homes have been purchased. To acquire these properties has cost the companies only the liberal provision of facilities, yet I am of the opinion that the company's own resulting values in its public service are even greater than the value of the homes so acquired and owned by its employees.

From the standpoint of a large employer, the field of ''personnel'' appears to be divided into two major parts:

> (a) Employee relations, which include vacations, employee recreational organizations, sickness and accident allowances, group life insurance and pensions or service annuities. This group is usually supported largely if not entirely by the employer as part of the cost of labor. Very liberal provisions for all the items mentioned here would probably add less than 3 per cent to labor costs.
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> (b) Thrift assistance, whereby, through deductions from the pay envelope, the employee becomes the possessor of some form of security, or the owner of his home under the usual building loan policy, which also provides a savings institution from which money saved may be readily withdrawn to meet any emergency. Here the contribution by the employer is simply the provision for bookkeeping or accounting, but no part of the cost of the property acquired by the employee.

It is not enough to preach thrift; the employee must be helped to acquire the habit of thrift. In order to bring this order of things about, the employee is encouraged to empower his employer to deduct a definite sum from the pay envelope and place it to his credit in absolutely safe-keeping until the time when a desirable investment may be made. The importance of such assistance cannot be overstressed. The employee never sees the money deducted, and is, therefore, without temptation to spend it. He rapidly adjusts his habits of expenditure to the sum he receives and so becomes a methodical saver and investor. Once the worker secures all he earns the temptation of spending becomes very strong and difficult to overcome. To deposit small savings in a bank or trust company is an inconvenience, sometimes of considerable extent. It would seem also that to most men and women there would be some disinclination to visit the usual banking office to make a small deposit—perhaps fifty cents or a dollar—amid surroundings indicating great wealth, with, perhaps, the added deterrent of an unsympathetic attitude on the part of the bank's representative, accustomed to receive large sums as deposits, towards those who are compelled to accumulate with very small savings. . . .

The adoption, on a national scale, of the theories advanced here is . . . desirable from the standpoint of better economics and as a stepping stone toward the recognition of the value of well-developed life in our country—the most important and most priceless of all our national possessions.

105. Typical Industrial Relations Attitudes of Electric Utilities *

EMPLOYMENT

Recruiting and Selection, and Job Specifications. The tendency is toward centralizing the selection of all employees in the employment office and ''the more comprehensive and definite employment practices are limited principally to those companies having centralized employment and personnel forces.''

''The almost universal practice is first to fill a position within the company from its existing forces either by promotion . . . or transfer.'' When, however, new employees must be drawn from the outside, application blanks are generally used giving the desired information regarding the applicant's history. ''Generally new employees are recruited to fill formal requisitions . . . from the heads of the departments. . . . Final acceptance of the new employee,'' who possesses, according to the opinion of the interviewer, the desired characteristics, ''generally rests with the head of the department,''' thus insuring "better cooperation on the part of the line organization.''

Medical examinations are frequently used but ''very few companies use any trade or psychological tests,'' which have not been found to have ''reached a stage in any case where they can be said to have given results of definite value.''

The chief value of job specifications lies in the fact that they furnish a basis of information for establishing comparatively fair rates of pay, that they facilitate relations between the personnel and employment departments and other departments, and that they furnish the Executive Department, upon request, complete information about any job. As a preliminary to any comprehensive preparation an accurate and correct organization chart is essential and ''no job analysis program should be undertaken unless a thoroughly definite and systematic plan is determined for keeping the analysis up to date.''

Education and Training. ''All employees of light and power companies need to be trained thoroughly in the most efficient methods of performing the details of their work, and, in addition, a large proportion of the employees require further training which will prepare them for making the most satisfactory contacts with the company's customers. . . . In the central station industry public relations is (sic) a highly important consideration, and because of the fact that the state of public relations is dependent to a great extent on the quality of the work and the attitude of subordinate employees the proper training of employees in the duties of their positions and the correct methods of dealing with customers is paramount. . . . An ideal education and training program would provide for all employees in the company from the executives to the employees in the ranks. . . .

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* Summarized from Report of the Industrial Relations Committee, National Electric Light Association, *Proceedings*, 1926, pp. 339-366.

"It is not industry's duty to educate employees but to train them. . . . Within recent years there is a marked tendency toward the development of closer relationships between power and light companies and schools and colleges. . . . In connection with these outside educational courses many companies have established the practice of assisting employees to further their education by paying a part if not all of the tuition fees under certain circumstances. . . .

"The program [of training] should follow as far as practicable along the line described with respect to the ideal educational and training program, bearing in mind that the training work should comprise the imparting of that knowledge to employees which knowledge will apply directly to their work and will enable them to carry on their functions in the best possible manner."

The courses of training include general instruction to new employees to fit them into the organization, training courses for technical students from colleges on the completion of their education, job training, confined mostly to the limits of the departments, supervisory or foreman training and executive training. "The job training field . . . is so large that the ground has scarcely been scratched. . . . Executive training has been attempted in industry with varying degrees of success. . . . The great necessity for it is not fully appreciated."

Incentive Forms of Compensation. "Most of the plans are of the bonus type, *i.e.* they consist of a basic wage or salary and a bonus upon all production beyond a specified task or quota. There are, however, cases among the plans for salesmen where a salary and commission on all sales are paid, and also where a commission only is paid, but a guaranteed minimum of earnings or a drawing account is provided. In only one or two cases among these groups of workers is the total compensation made entirely on returns from a commission or on a piece-rate basis. Certain important companies have set up group bonuses based upon the performance of the group or several groups. In some cases the companies require part of the bonus to be placed in savings deposits, such as employee building and loan shares or interest bearing certificates. . . . In general . . . the purpose in establishing wage incentives is much as expressed by one of the large member manufacturing companies, namely: (1) to guarantee cost and insure return on investment; (2) to reward efficiency and extra work; (3) to reduce wastage of both material and time; (4) to remove the sting of drive from our relations with employees; (5) to reduce mistakes as to the relative value of employees to the company."

Pensions. "There is a three-party interest in public utilities and the consideration of a pension plan must take into account the effect on the three interests involved, namely: the public, the company, and the employee. The public is concerned in the efficient operation of a utility because of the effect on rates and character of service rendered, and it also is interested in preventing persons from becoming a public charge. The company desires to maintain high efficiency and morale in its organization, and provision for superannuated employees and promotion of younger men is necessary to attain these ends.

"From the standpoint of the employee, a pension plan will assist in solving some of the responsibilities of life that he must carry, so that by materially reducing his worries his efficiency, loyalty, and continuity of service are increased. All of these interests are therefore benefited by the creation of a pension plan. . . .

"First, a fund must be created on a different financial basis from that generally adopted in establishment of other reserves, so that accrued liabilities may be provided for by reasonable annual increments and the higher costs of later years may be financed by adequate accumulated reserve. Second, actuarial calculations are absolutely necessary in determining accrued liability, and in estimating amounts needed to pay the annuities. Third, the pension fund should be safeguarded. Fourth, the plan should be carefully administered."

Thrift Plans. "The main object of benefit associations is to provide the employees with an organized, systematic and cooperative means of protection against the losses due to sickness, accident, and death; and to eliminate the system of occasional and voluntary contribution of funds for disabled employees. . . . Aside from these main objects, some associations have for their objects social, educational, also beneficial (aims); some associations express the purpose of promoting fellowship and good feeling among their members.

"Group insurance either automatically furnishes to or lends an opportunity for each employee having substantial protection against death or permanent disability, depending upon the plan in use in various companies. Equal protection is offered to all classes of employees, whereas some would find personal life-insurance rates prohibitive because of the risk involved in their work. . . .

"The building and loan associations are organized for the purpose of encouraging industry, frugality, home-owning and the saving of money by members, the accumulation and investment of such savings, the loaning of such accumulation to members and the repaying to each member of his savings. . . .

"Stock ownership plans enable the employees to invest their money safely on easy terms. Such plans by providing a means of saving and investment of money encourage thrift among the employees. . . .

"Thrift plans conducted properly should have a very desirable effect on all concerned by inculcating the habit of thrift and increasing the confidence and loyalty of the employees of the organization."

Health. The problem is one of awakening "an interest among the company executives in the great problem of medical selection" by physical examination, and of "medical training and supervision of the employees" by periodic re-examination, and health education in coöperation with community programs. Thus, "through systematic well-planned efforts the sickness rate should be cut from its present average of 8.5 days per employee per year."

CHAPTER IX

TAXATION OF PUBLIC SERVICE CORPORATIONS

106. Taxation of Public Service Companies *

In practice, the tax matters of public service corporations are handled by their legal departments but many of the larger corporations have special tax departments. The tax commissioners of these larger corporations are often men whose training, long experience, and wide reputation give them a standing in hearings before regulatory commissions and courts that the ordinary taxpayers' representatives do not always have.

Although the details are handled by these tax and legal departments, management ought to have at least a bird's-eye view of the general field of taxation. In fact, the troubles of the public utilities have been increased in recent years by lack of a comprehensive view of tax problems on the part of management. Such a view should include some knowledge of the following: I—the background of public utility tax policies; II—present methods of taxation; III—the actual results of present methods; IV—the present legislative trend; V—plans for relief and improvement.

The Background

The background of public service taxation is interesting because tax policies have swung from one extreme to the opposite. In the development of this field of taxation there have been four fairly distinct periods, each characterized by a general type of tax policy.

1. The earliest policy was not one of taxation, but of subsidy. In the early period of the development of this country the public utilities consisted chiefly of the canals, turnpikes, and railroads. In this period means of transportation and communication were so essential that these agencies were thought of as public works, and proper objects not of taxation but of expenditure. In a decision in Massachusetts in 1842, the court took occasion to enumerate the so-called "public works," the list including forts

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* From Herbert D. Simpson, Manuscript of lecture, Northwestern University, School of Commerce.

and arsenals, court-houses, jails, and railroads as objects of public expenditure.

In accordance with this view, most of the states very early adopted policies of liberal public aid in the form of loans, subscriptions to stock, and gifts of public land. This policy was carried to such extravagant extremes that in the end it bankrupted many of the treasuries and contributed to the general collapse of 1837 and the period immediately following.

2. Even the abandonment of a policy of subsidizing the public utilities did not mean taxation, however, for most of the states continued as liberal a policy as possible, which meant more or less complete exemption from taxation. Exemptions were conferred in the charters granted to these companies and also in general legislation and in special statutes. Even where exemption was not conferred by actual statute, the courts were inclined to construe that the granting of a state charter implied exemption from local taxation, unless specifically provided otherwise.

Most of the early railroad charters provided exemption from state and local taxation. The Baltimore and Ohio Railroad, by its charter, was exempt from taxation forever; although some years later, by special agreement in return for certain considerations from the state of Maryland, the railroad company agreed to pay to the state 1 per cent of its gross earnings. The Richmond, Fredericksburg and Potomac Railway was exempt from taxation under a charter which it held until 1913. The Vermont Central was exempt forever by its charter; and in spite of repeated attempts by the state to change its charter, the state was never able to impose any taxes on the road until the company went bankrupt and was taken over by the Central Vermont. The policy of exemption continued until the middle of the last century, and in a number of states until a still later period. Even Michigan, a pioneer in the uniformity movement, set the northern limits of uniformity at parallel 44° by a statute of 1891, providing that any road built north of that parallel should be exempt from taxation for a period of ten years.

3. But by the middle of the century, most of the western agricultural states had begun to experience recurring "hard times," in consequence of low prices of farm products, heavy indebtedness incurred for the purchase or development of farms, and high taxes brought about partly by the governmental extravagances of the previous period. Out of these conditions there developed a general movement throughout the western states for the taxa-

tion of railroads and other corporations upon the same basis as individuals. But how deeply the idea of exemption had become imbedded is indicated by the fact that any movement for the taxation of railroads was considered ''radical.'' Under the leadership of Illinois, Wisconsin, Michigan and Ohio this movement spread rapidly until some two-thirds of the states had adopted constitutional amendments requiring the uniform taxation of all property, including that of the railroads and other public service industries. The Ohio uniformity clause was particularly sweeping, requiring that all corporations then existing or formed thereafter, should ''forever'' be taxed in the same way as individual property owners; and this clause became a model in the adoption of uniformity rules by other states.

The uniformity movement failed, however, to secure real uniformity, largely on account of the failure to provide any administrative machinery. Almost the universal form of taxation at the time was the general property tax, with local assessment. Any attempt on the part of township assessors to assess railways and other large properties extending through several states and innumerable taxing districts was necessarily doomed to failure. In Ohio particularly the movement came in like a lion and went out like a lamb; for the ponderous ''forever'' of 1851 was followed by a mildly worded statute, making railroad officials the assessors of their own roads. When these officials failed to assess their property adequately, a statute was enacted making the county auditors of the counties through which any railroad ran a board of assessors for this road. Needless to say, the county auditors did not greatly improve upon the assessments of the railroad officials themselves. Annual meetings of these temporary boards of assessors were usually held at Cleveland, Columbus, Cincinnati or other large cities, where the assessors were transported free of charge and given free entertainment by the railroads; and on the last day of their convention they usually met in a private car of the railway company, with officials of the company, and worked out the assessment of the railroads. Conditions were more or less similar in most of the states that had adopted uniformity requirements.

4. The general dissatisfaction over the taxation of railways and public service industries was soon aggravated by other unfortunate conditions throughout the western states. Beginning about 1873, the country experienced a period of rapidly falling prices, which continued until 1896. Prices of farm products declined even more rapidly than the general price level; and

farmers burdened with debt suffered particularly in consequence of declines in their income with no decrease in the amount of their indebtedness. One of the ironical features of the situation was the fact that it was the very success of previous policies of stimulating railroad building that brought about an undue expansion of agricultural areas, over-production of agricultural crops, and many of the consequent ills of the western farmers.

Naturally, however, the irony of the situation was not appreciated at the time; and out of the distressing conditions prevailing throughout most of the agricultural states there developed a series of radical movements, such as the Granger, the Greenback, and the Populist movements. These movements were directed mainly toward regulation of corporations and other matters; but along with these things there was an insistent demand for some means to compel the railways and other large corporations to carry a fair share of the tax burdens.

In an effort to accomplish this end, a variety of special forms of corporation taxes were worked out and enacted by most of the states. This is known as the movement for special corporate taxation, and this completes the general development of tax policies with reference to the public service industries. Many of these special taxes proved very burdensome and some of them actually discriminatory; and this suggests the extent to which the pendulum in this field of taxation has swung from outright subsidy and exemption at one extreme, through the uniformity period, and over to high and discriminatory taxes at the other extreme. Out of this last period grew the various forms of taxation which are still in operation, and which we will consider next.

Present Methods of Taxation

There are from fifteen to twenty-five various kinds of taxation applied to public service industries in one state or another in this country. Most of these taxes, however, can be classified under a half dozen general groups:

1. General Property Tax.
2. Ad Valorem Taxes.
3. Capital Stock Taxes.
4. Gross Earnings Taxes.
5. Net Income Tax.
6. Franchise Taxes.
7. Miscellaneous Taxes.

1. General Property Taxation means the taxation of property under the old system of local assessment. This type still survives to a surprising extent, particularly in such states as Rhode Island, Maryland, Delaware, and Illinois. In Illinois, real estate and buildings outside of the right-of-way are still assessed by local assessors.

2. Ad Valorem Taxation, that is, taxation according to value, means (1) the assessment of an entire property as a going-concern, in contrast with the old piecemeal assessment of particular pieces of property under the general property tax; and (2) a centralized administration of the tax. Whenever the term *ad valorem* is used it implies this ''unit rule'' assessment, administered by a central body, such as the state tax commission or other central department.

3. Capital Stock Tax is a specific rate applied to the capital stock, based in general simply on the par value of the total amount of stock. Pennsylvania has been the outstanding example in the development of this type of taxation.

4. Gross Earnings Taxation has been much criticized on the ground of being unscientific and of taking no account of the net income and tax-paying ability of different companies. It has at least the merits of definiteness and precision. In four states this is the chief form of taxation of public service industries, namely, in Maine, Connecticut, Minnesota and California.

5. Net Income Taxation has always been a favorite in tax theory, but has so far played comparatively little part in actual legislation. Nine states apply some form of net income taxation to public service industries, namely, New York, Massachusetts, North and South Carolina, Tennessee, North Dakota, Montana, Missouri and Mississippi. The rates range from one half of one per cent to five per cent. In none of them, does net income taxation constitute the chief form of taxation applied to the public service industries.

6. Franchise Taxation. In an early period when franchises were granted in perpetuity or for long periods and with no restriction upon rates that might be charged, public utility franchises frequently represented enormous values. In this period franchise taxation meant a very definite form, and one with a good deal of justification. Under regulation, franchises have ceased to represent the values which they formerly did, and franchise taxation no longer represents a distinct form of taxation. Taxes designated as franchise taxes in the statutes are now laid upon capital stock, gross earnings, appliances and equip-

ment, and almost any other attribute that chances to afford a convenient basis for taxation.

7. Miscellaneous Taxes range from lump sums levied upon companies as a whole to taxes on cars, wheelage, telegraph poles, telephone instruments, passengers carried, etc. In Delaware, practically all the railroads pay taxes in the form simply of certain lump sums annually. The Philadelphia, Baltimore and Washington, for instance, has for many years paid a lump sum of $50,000 a year. In the southern states particularly, telephone companies are taxed at so much per pole, express companies so much per mile, railroads so much per car and so on.

ACTUAL RESULTS

The results of these general methods of taxation, to the public utilities, may be briefly summarized under three heads. In the first place, there has been an enormous amount of irritation and unnecessary expense in consequence of the heterogeneous variety of taxes and confused methods of administration. When a large railroad system has to pay taxes in every tax district it traverses, it means in any case an endless amount of clerical work and a wasteful amount of expense. A North Carolina statute of 1921, for example, provided that towns and villages as small as those with a population of 500 might impose license taxes of $5 on express and on telephone and telegraph companies passing through these towns. Such methods of taxation applied to a large railway corporation would mean that it would require the time of a considerable staff to write the tax checks alone, to say nothing of the time required in all the other processes connected with assessment and taxation.

In the second place these methods of taxation have developed great inequalities among the different groups of public utilities, and between the public utilities on the one hand and other forms of property on the other hand. The mere centralization of assessment of public service properties has brought about much greater efficiency in assessment, and this ordinarily means higher assessment than that which results from the local assessment of other forms of property. There appears to be little doubt that throughout the country in general public utility property has been assessed by tax officials at a higher proportion of true value than are most other forms of property.

And in addition to the greater efficiency of the assessment, the inclusion of intangible values in the assessment of public utilities has still further increased the inequality. When a public utility is assessed on the basis of capitalization of earnings or on any other basis under the "unit rule" method of assessment, the assessment necessarily includes elements of good-will values, going-concern value, and all the intangible values that grow up about a successful business. On the other hand, the assessment of the property of a great metropolitan newspaper ordinarily includes merely the value of buildings, machinery, equipment and other tangible portions of property. The good will, which in the case of a successful newspaper is ordinarily many times the value of its physical property, is not assessed for taxation. The inclusion of intangible values in the assessment of one class of property and the exclusion of these values in the assessment of another class means a large degree of inequality in assessment.

In the third place double taxation of public utility property frequently results from the various methods of apportioning system value among different states. Two or three adjoining states may assess the entire system value of a public utility with some degree of fairness. But in the apportionment of this value among the various states through which the property runs each state is often tempted to use that method which will assign to it the largest possible share in the total value. If one state apportions on the basis of property account, another on the basis of gross earnings, another on the basis of mileage or some other factor, it frequently happens that the sum total of the various apportionments is much larger than the total value of the property.

Legislative Trend

Public utility managements should keep in close touch with the general trend of tax legislation from time to time, in order to understand the large movements that are going on, and as far as possible to work with rather than against them. For example, much of the tax legislation that has come from the agricultural states in the past six years is a reflection of the agricultural depression beginning in 1921, and represents efforts on the part of the farmers to secure relief from the heavy burdens of taxation which they have actually been carrying, and which during the past few years they have been in poor position to continue to carry. A public utility management which has an intelligent appreciation of the position of the farmers and is willing to put forth intelligent efforts for the relief of the agricultural situation is much more likely to protect its own industry from undue increases in tax burdens than a management which fails to appreciate the situation.

REMEDIES

And finally, public utility managements should keep in close touch with the scientific work that is being done in taxation and with general movements on the part of business and civic organizations to bring about improvement in our methods of taxation. Meetings of the National Tax Association, of various regional tax associations and of some taxpayers' organizations afford opportunity for keeping in touch with current thought on tax subjects. Furthermore, a great deal of scientific investigation in the field of taxation is being carried on by joint legislative committees, special commissions, by particular groups of taxpayers and by universities and colleges. Out of all this thought and work on the subject grow suggestions and proposals, which from time to time are enacted in actual legislation; and these things are of more than academic interest to public utility managements. Out of responsibility for their own properties, therefore, as well as their public interest in these questions, a modern public utility management should consider it a part of its field to keep in intelligent touch with the scientific and disinterested thought in the general field of taxation.

107. Recent Proposals on Public Utility Taxation*

APPRAISAL OF PRESENT TAXATION

Ad Valorem Taxation. The ad valorem method of taxation represents not so much a single method as a composite of more or less all methods, particularly of property and net income taxes. Some form of physical value or property appraisal generally constitutes a minimum assessment, whether the property is showing any earnings or not. From this minimum, assessments are graduated upward, largely with reference to earnings. It comes to much the same result as if the statutes had said: All public service companies shall pay a minimum tax on their property, regardless of earnings, plus a tax on earnings in the case of companies showing any earnings in excess of a fixed annuity on property value.

The striking characteristics of this method are the large delegation of power to the tax commission and the extreme flexibility in methods and results permitted. The tax commission is virtually authorized to levy taxes upon the property, securities, gross earnings, or net income as it sees fit, through its freedom to employ any of these elements in making its assessments and indeed without being obliged to inform either the taxpayer or the public of the methods employed. With this power and the variety of methods and combinations of method at its disposal, it becomes possible for the commission to lighten or increase the load within a wide range of discretion. This is not meant to imply that the power conferred on the commission has been abused in the one direction or the other, but there is no doubt that in some of the ad valorem states, tax departments have based their assessments not so much upon the results of any method as upon their own judgment as to what the utilities "ought to pay." It is impossible therefore to appraise the ad valorem method as a method, since any appraisal becomes virtually an appraisal of the personnel, methods, and policies of particular tax commissions or departments.

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* Excerpts from Herbert D. Simpson, *Taxation of Public Service Corporations*, Chap. XV. (Manuscript.)

It may be said, however, that ad valorem assessment is expensive, both for the state and the public utilities. For the latter a good deal of the expense has arisen from the necessity of maintaining legal and statistical departments for the collection of data on sales values and assessment of other property to be used in the annual struggle over their own assessments and in frequent litigation. The degree of equalization attained appears to range from definite provision therefor in the statutes and conscientious effort on the part of the commission to secure it, to patent discrimination—sometimes in favor of the public utilities and sometimes against them. In brief, it may be said that if the ad valorem method in general is to provide the means for a more equitable system of taxation, tax officials must be more free from political influence than they have been in many states; larger powers of control over local assessment must be conferred upon the state tax commission or tax department; and provision must be made for the application of more nearly similar methods of assessment to public utility and other property.[1]

Gross Earnings Taxation. The gross earnings method of taxation has the merits of simplicity, precision, and minimum expense of administration, and probably involves a minimum amount of dispute and litigation. It is based to only a slight extent, however, on any consideration of ability, benefit, or other philosophical principle of taxation, or on any principle of equality as between public service property and other property in general. In short, it represents the absence of most of the theoretical attributes of sound taxation, offset by a high degree of administrative and practical merit.

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[1] For further criticism and appraisal of ad valorem method see *Report of Minnesota Tax Commission* (1912), Chap. 15; H. L. Lutz, *The State Tax Commission* (Cambridge: Harvard University Press, 1918) Chap. VIII; T. S. Adams, "The Valuation of Railway Property for Purposes of Taxation," *Journal of Political Economy*, XXIII (1915), 1-16.

Sometimes, as in the early years of the gross-earnings tax in California, and to some extent in Connecticut, careful scientific effort has been made to fix the rates at a point which would make the burden approximately equivalent to that carried by other property subject to property taxation. But rapid changes in operating conditions make any such adjustment at the present time extremely difficult and uncertain; and, in general, the gross-earnings tax represents a frank abandonment of any effort for equalization of burdens in return for the administrative merits of the tax.

It must be admitted, however, that the actual degree of equalization of burdens secured under our present ad valorem and miscellaneous taxes has been so slight that even a rigid system of gross-earnings taxation throughout the period covered in the present study could scarcely have produced more arbitrary and erratic results. Likewise the differences in methods and in the efficiency of assessment of public service property as compared with property locally assessed are so great that the gross-earnings tax could hardly represent a greater degree of ''separation'' and differentiation of public utilities as a class than that actually accomplished under present methods. In short, unless ad valorem systems are improved along the lines already suggested, even the theoretical student may readily find a balance of merit in the gross-earnings method on account of its simplicity, precision, and economy of effort and expense on the part of both government and taxpayer.

Net Income Taxation. This form of taxation has the merit . . . of basing taxation specifically upon the principle of ability to pay. The most general ground of objection to net income taxation in the past has been the difficulty of assessing net income. The establishment of the Federal Income Tax and of a number of state income taxes, and the development of accounting methods in recent years have largely removed that ground of objection. In the corporate field at least, presumably no one would longer suggest that a valuation of assets can now be ascertained more readily or accurately than corporate income.

Probably the most substantial objections to net income taxation now rest on the grounds that the government must be assured of continuous revenue, which might not be possible in periods of depression if a substantial portion of its revenue depended upon a tax on net income; and that individuals and corporations who employ property and enjoy the benefits of government are under some obligations to pay taxes whether their business activities result in net income or not.

RECENT PROPOSALS

Three committees in recent years have offered comprehensive programs involving the field of public service taxation.

Committee of the National Tax Association on a Model System of State and Local Taxation. This committee, under the chairmanship of Professor Bullock, of Harvard University, was appointed in 1916 and presented its report three years later.[2] The committee's subject had no specific reference to public utilities as a group, and the position of public utility taxation in a broad plan of state and local taxation is therefore of particular interest.

The committee recommended a threefold system of taxes intended to reach persons, property, and business, supplemented by inheritance taxation. The threefold tax system recommended was:

1. A property tax on tangible property; public utilities and all ''state-wide'' property to be assessed by a state tax commission; local assessment districts to be enlarged at least to a size that would justify the employment of one permanent assessor at full-time; and the tax commission to have large powers of supervision over local assessments.
2. A graduated personal income tax.
3. A flat corporate net income tax to represent a tax on business.

The proposed plan has the merits of conforming to American conditions—and traditions; of simplification, especially in its substitution of a single form of tax on business in place of the heretofore generous assortment of business taxes . . . ; of assuring continuous revenue to the government, while making property taxation only one element instead of the sole or chief source of revenue; of providing for effective assessment and equalization, and the application of substantially similar methods of assessment to the public utilities and other property; and, through the element of net income taxation, of adjusting tax burdens more nearly to ability to pay.

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[2] *Proceedings of National Tax Association* (1919), pp. 426-470.

In its application to public service industries the committee's plan would afford relief in the fact that (a) the total burden of taxes levied directly upon property and industry would be reduced by the portion of the burden transferred to inheritances and personal incomes; (b) that the taxes levied on public service industries would be only two; namely, taxes on tangible property and net income, instead of the multitudinous taxes now levied; (c) that both of these taxes, in the case of public service industries, would be administered by a central state department; (d) that the taxation of *tangible* property only, in the case both of public utility and of other property, would put the assessment of public utility property on the same basis as that of other property; and (e) that the division of the burden upon public service industries between property and net income taxes would result in at least a somewhat nearer adjustment of burdens to different degrees of prosperity and ability to pay.

New York Special Joint Committee on Taxation and Retrenchment.[3] The report of this committee, transmitted to the legislature March 1, 1922, has attracted deservedly wide attention on account of the distinguished personnel represented in the membership of the commission and its staff and on account of its illuminating analysis of tax conditions in New York State. The committee recommended, "as an immediate step," the adoption of a combined gross- and net-earnings tax on public service corporations. . . .

Of equal scientific interest probably is the committee's tentative conclusion with regard to public service taxation that "the ultimate program toward which the state must strive should include a tax on real estate, narrowly defined, and a tax on pure economic profit. The Committee is not convinced that it should contain any other elements."[4]

The Committee conceives the true function of a public utility tax to be to supplement regulation:

> Public control of rates conditions the problem in a fundamental manner. *The true function of a public-utility tax under these circumstances is to supplement rate regulation.* It should be so designed that, in cases where several companies operate under the same controlled rate, as much as is possible is recouped for the State from the profits

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[3] See Report, March 1, 1922, Legislative Document No. 72.

[4] Report of the Committee, p. 111.

> of the companies which are so favorably circumstanced as to be able to earn more than a fair return. It should be so arranged, also, as to bring back into the public coffers in the case of all companies as large a share as possible of the profits arising from the necessary inexactness of the rate fixing process.[5]

Herein the Committee appears to be basing its policy on a philosophy that had more validity a generation ago than now. In an earlier period, under conditions of unlimited franchises and in the absence of regulation, taxation could reasonably be resorted to as a means, not of protecting the public, but of indemnifying it for losses from which it could not be protected. Regulation has now supplied a better remedy and removed the necessity for resorting to the poorer, certainly the necessity for employing both. Indeed the entire implication of such facts and analysis . . . would appear to be that regulation and taxation are two distinct things; that just as the taxing authority need not relinquish the claims of taxation merely because the regulating authority has too rigorously reduced public utility earnings, so the taxing authority need not assume the responsibility of annihilating profits in excess of the particular level contemplated by some regulating authority. In particular, to shape taxation in such a way as to constitute a trap for any profits that may exceed the arbitrary limit fixed by the regulating authority is to subject the public service industries to a type of taxation that is not imposed on any other industry or groups of taxpayers.

We have already seen [6] that when the regulatory authority undertakes to extend its functions over the field of taxation, it frequently imposes unnecessary responsibilities upon itself and causes unnecessary confusion in the field invaded. In the same way, when the taxing authority comes to consider the "true function" of a tax to be that of supplementing rate regulation, it likewise is assuming uncalled for functions and only adding to the confusion in both fields.

The purpose of regulation, we take it, will be conceded to be in general the elimination of certain undesirable conditions in the public service industries and the assurance of reasonable rates and service in these fields. Regulation, in short, has always been concerned with controlling conditions of service and rates, and incidentally thereto of capitalization, financial operations, and other processes *within certain fields of industry affected*

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[5] Report of the Committee, p. 111 (Italics our own).

[6] H. D. Simpson, *Taxation of Public Service Corporations*, Chap. IX.

with a public interest. It has never, avowedly at least, embraced the socialistic purpose of leveling the wealth or income of any particular class of property holders. It is not the *income* of public utility investors that is "affected with a public interest." If it were, there are simpler and more direct means of reaching this objective than through the elaborate machinery and procedure of regulation. Regulation takes account of income, but only as a clew to the reasonable cost of capital for investment in the various fields concerned.

Unless, then, the purpose of regulation is conceived to be something very different from its recognized purpose in the past, it is difficult to see how a tax based on the principle purposed by the committee has any relation to the purpose of regulation, or can in any ordinary sense be said to *supplement regulation.* It amounts merely to imposing upon a certain group of industries, classified by the circumstances of being subject to regulation, a special tax not imposed on any other type of industry.[7]

Committee of the National Tax Association on the Taxation of Public Utilities.[8] This committee was appointed in 1920 and presented its report in 1922. It followed the previous committee of the National Tax Association in recommending a combination of one fixed and one flexible element; but substituted, as the fixed element, a flat tax on gross earnings instead of the former committee's tax on tangible property, on the ground that "the gross earnings tax is no worse, indeed is probably better, than the property tax." This fixed element is supplemented with a tax on net earnings, or more accurately a tax computed on gross earnings but graduated according to "the ratio of net to gross."

The result is a progressive gross earnings tax (graduated according to operating ratio), but a regressive net income tax, beginning at 100 per cent or over in the case of companies showing no net earnings or deficits and declining (as the proportion of net earnings increases) until the rates on gross and net tend to approximate the same figure. In the committee's illustrative tabulation, based on an initial gross earnings rate of 1 per cent and with net earnings varying from 5 per cent to 40 per cent of gross, the resulting tax represents a rate on gross earnings of from 1 per cent to 3 per cent and a rate on net earnings varying from 20 per cent to 7½ per cent.[9]

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[7] For statement of contrary view, however, see proposal of Professor Bauer to take all "excess profits" above a fixed return as a "special franchise payment," in *American Economic Review*, VI (1916), 568; J. C. Bonbright, "Progress and Poverty in Current Literature on Valuation," *Quarterly Journal of Economics*, XL (Feb., 1926), 295-328; H. H. Hartman, *Fair Value* (New York: Houghton Mifflin Co., 1920), Chaps. I and II. It is significant of the difficulty of trying to think of investors' income as one of the objectives of regulation that the latter writer asserts in Chapter I, "The public has an interest in profits"; but when in Chap. II, on "The Purpose of Regulation," some eight specific purposes are enumerated, the limitation of profits is not included among them.

[8] *Proceedings of National Tax Association* (1922), pp. 162-194. Senator Frederick M. Davenport, of New York, who had been chairman of the New York Committee already quoted, was also chairman of the National Tax Association Committee.

The combination of gross and net earnings taxes is one that has frequently been suggested. Mr. Lawson Purdy, while President of the Department of Taxes and Assessment of New York City, suggested a small gross earnings tax of not more than 2 per cent, supplemented by a tax on dividends and interest as the most practicable approach to net income under the conditions of public utility accounting at that time.[10]

Four years later Mr. Allan Ripley Foote presented an elaborate statement, reinforced by considerable legal and statistical material, in support of a tax beginning with a flat rate of 2 per cent on gross operating revenue, applicable to all companies whose operating ratio was 90 per cent or over, the rate to increase by 1/16 of 1 per cent for each 1 per cent by which the operating ratio dropped below 90.[11] The rate of progression was therefore very similar to that provided in the committee's plan, in which the rate increases ¼ of 1 per cent for each 5 per cent decline in operating ratio.

The logic of continuing to recommend "special" taxation of public utilities as a group does not appear conclusive. The committee bases its special treatment on two grounds: (1) the special characteristics of public utility property, namely, its highly "technical" character, "widespread location," and the fact that public utility property can generally be appraised only as an unit; (2) the fact of regulation.

With regard to the special characteristics of public utility property, it may be observed that in an earlier period, when the great mass of general property consisted of farms, ordinary real estate and the simpler forms of tangible personal property, the characteristics enumerated did effectively differentiate the railways and early public utilities from most other property. But in the past quarter century other forms of commercial and industrial property have grown in size and have developed such a degree of specialization, integration, and unified operation that it may be questioned whether the mere size and physical aspects constitute any longer a sufficient difference between public utility and other property to necessitate special treatment of the former in matters of taxation.

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[9] See Committee's suggested Schedule of rates, p. 550 *infra.*

[10] *Proceedings of First National Conference on State and Local Taxation* (Columbus, Ohio, 1907), pp. 67-70.

[11] *Proceedings of Fifth Annual Conference on State and Local Taxation* (Richmond, Va., 1911), pp. 193-233.

There are many forms of property other than public utilities, such as newspapers, hotels, and theaters, which can be appraised only as a whole—if the full value is actually desired—and are appraised only in that way when they become the objects of actual purchase and sale. There are many forms of industrial operations that are spread over more than one taxing jurisdiction. In fact, so far as the mere physical aspects of the property are concerned there is no more reason why the additional values of a unit assessment should be imposed upon the wagons of an express company than upon the buses of a motor transport company operating over a regular route or the wagons of a milk distributing company operating in more than one local taxing district.

Finally, it would be a commonplace to call attention to the highly technical and specialized character of much machinery and equipment, of factories, and even of buildings, which renders them at least as valueless for other than their specialized purposes as the general run of public utility equipment would be for other uses. There is much mining property that combines in high degree all three characteristics in the fact that it extends, both above and below ground, through more than one taxing district, can properly be appraised only as a whole, and obviously cannot be transferred to any other ''use,''—as was discovered by the stockholders, in a small Ohio town, of a western mining venture that had failed. In a desperate effort to salvage something from the property a committee of stockholders had enumerated various possible alternatives, such as maintaining the property until cheaper methods of extraction might make its operation possible, the quarrying of rock and clay, and even its availability as a tunnel through the mountain for a projected railway route, when a small lady school-teacher rose and inquired whether it would not be better ''to fill the hole up and just use it for a mountain.'' So the specialized character which has so long done duty in discussions of public utility taxation, is under modern conditions a characteristic of a vast amount of other than public utility property.

If it should be deemed desirable to adopt a deliberate plan of property classification for purposes of taxation, the general characteristics of public utility property might well afford ground for making a separate "class" of that form of property. But in the absence of any general scheme of classification, to make the mere physical characteristics of public utility property the ground for continuing to devise "special" taxes for these groups, is to a considerable degree basing tax policies on the conditions of a half-century ago.

With regard to the regulative aspect, the committee adopts the position of the New York Committee, to the effect that:

> The peculiar position of the public utility, as a privileged and regulated enterprise, appears to the committee to require a special tax treatment in order to carry out completely the principle of rate regulation. . . . Rate regulation and taxation must go together and supplement each other. . . . Changes in the legal rate limits occur at more or less long intervals. In the interim changed conditions may permit of higher profits than were contemplated. . . . Taxation should be relied upon to take for the public a part of the extra profits made under unexpectedly favorable conditions or by the more fortunate corporations.[12]

. . . The schedule of rates suggested by the committee actually does only in slight degree what the theory above would intimate.

In the first place, the rates are graduated with reference not to the *rate of return* but to the *operating ratios* of the different companies. The two things, of course, are very different. A company with a large volume of business in relation to capital employed may operate on a close margin (that is, a high operating ratio) and still show a higher return on property value than a company operating on a wider margin but with a smaller volume of business in relation to capital employed.

The reports of prosperous railways operating in dense traffic territory frequently afford illustrations of a low ratio of net to gross (a high operating ratio) associated nevertheless with a liberal rate of return on property value; while in the case of western roads, operating in "thin" traffic territory, even a low operating ratio frequently fails to yield a fair return on the property. Wide disparities between operating ratio and rate of return on property are exhibited by different groups of utilities, by individual utilities in the same group, and by the same groups and utilities in different periods.

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[12] Report of The Committee, *Proceedings of National Tax Association* (1922), pp. 169-170.

In the second place, the rate of graduation is so slight that the actual result is not a progressive or even a proportional but a regressive net-earnings tax,[13] as indicated by the committee's illustrative tabulation below:[14]

TABLE 52-A

RATIO: TAX TO NET

GROSS EARNINGS	NET EARNINGS	RATIO NET TO GROSS	RATE	TAX	RESULTING RATIO OF TAX TO NET
$100,000	Not over $5,000	Not over 5%	1%	$1,000	.20 or more
$100,000	5,000 to 10,000	5% to 10%	1¼%	1,250	.25 to .125
$100,000	10,000 to 15,000	10% to 15%	1½%	1,500	.15 to .10
$100,000	15,000 to 20,000	15% to 20%	1¾%	1,750	.116 to .087
$100,000	20,000 to 25,000	20% to 25%	2%	2,000	.10 to .08
$100,000	25,000 to 30,000	25% to 30%	2¼%	2,250	.09 to .075
$100,000	30,000 to 35,000	30% to 35%	2½%	2,500	.083 to .071
$100,000	35,000 to 40,000	35% to 40%	2¾%	2,750	.078 to .068
$100,000	Over 40,000	Over 40%	3%	3,000	.075 or less

For example, if two companies have gross earnings of $2,000,000 each, from which one saves $100,000 to net and the other $200,000, their taxes would be as follows:

TABLE 52-B

GROSS EARNINGS	NET EARNINGS	RATIO NET TO GROSS	TAX RATE ON GROSS	AMOUNT OF TAX	TAX RATE ON NET
A $2,000,000	$100,000	5%	1%	$20,000	20%
B $2,000,000	$200,000	10%	1¼%	$25,000	12½%

B, with net earnings twice as large as A's, pays on its second $100,000 of net only $5,000 additional tax, or at a rate of only 5 per cent on this second stratum of earnings, compared with a rate of 20 per cent on the first stratum.

It will probably be with reference to this practical result rather than to the quite different theory on which it is based that advocates of ad valorem or of income taxation will be inclined to question the committee's plan. It is essentially a gross earnings tax, modified by a slight consideration of net earnings—and of net earnings in the form of operating ratio, not in the form of final net income.

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[13] "Net earnings" as used by the committee means apparently net operating revenue.

[14] *Ibid.*, p. 175.

Meanwhile, it will probably have occurred to the reader that under the decisions of the United States Supreme Court discussed in a previous chapter,[15] there ceases to be any reason for any graduation of rates, whether upon gross earnings, net income, or other basis. Under the Galveston and Georgia decisions all public utility taxes, even income and profits taxes, are construed to be charges upon consumers and to the extent that regulation becomes effective will therefore become consumption taxes. It is conceivable that a consumption tax might be graduated according to the amount of one's consumption, if that were considered an index of ability to pay. But certainly there can be no reason for graduating a consumption tax according to the condition of the various concerns from which a consumer may purchase goods. Why should a *consumer* pay higher taxes because he patronizes a utility that has a low operating ratio?

Further Possibilities of Relief. An adequate solution of the problem of public service taxation must involve a recognition of the fact . . . that under modern conditions the public service tax problem is inextricably tied up with the general problem of taxation and cannot be separated from it. There *are* distinct tax problems—such as the problems of inheritance taxation and the protective tariff—in the sense of special forms of taxation that are not necessarily connected with the general tax system; that rest on their own theoretical grounds, and are associated with particular forms of public policy. This may once have been the case with public service taxation, in periods when questions of taxation were involved in a general governmental policy of fostering the development of transportation by subsidy and other means. Under modern conditions this is no longer true in the case of public service taxation any more than in the case of farm taxes or manufacturing taxes; and attempts to make special problems of these fields of taxation generally only add to the confusion.

When the Federal Trade Commission, for example, asserted in 1924[16] that "'plans for a reduction of the present great burdens of taxation should be adjusted *especially with a view to this decreased condition of agriculture*,'"[17] it presumably did not realize how rapid indeed the adjustment would have to be in order to remedy the condition before the condition itself had materially changed. But there is no more faulty principle in taxation than that of trying to readjust it to every temporary condition of some particular class or industry. It is common knowledge that in general our present methods of taxation rest heavily upon any industry or group of taxpayers in distress; and if we are to be continually running with first aid to the injured, now in one quarter, now in another, we shall get nowhere with improvement of the system itself. Any adequate remedy for the conditions existing in the public service field in the past decade must depend therefore not on any "special" relief but upon readjustments in the general system of taxation. . . .

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[15] Chap. IX.

[16] Federal Trade Commission Report, Senate Document No. 148, *Taxation and Tax-Exempt Incomes* (Washington: United States Government Printing Office, 1924), p. 84.

[17] Italics our own.

108. Unjust Federal Tax Exemption *

There has arisen a condition productive of serious inequalities in tax burdens and highly discriminatory business conditions which can be corrected by simple legislative enactment. . . . We refer to the practice of the Federal Government in exempting from its taxation those bonds and obligations which political subdivisions of the States issue from time to time for the purpose of constructing or operating public utilities, and the interest on which is payable out of the revenues of such utilities. Mr. Philip H. Gadsden, in a statement presented to the United States Senate on behalf of the American Electric Railway Association as well as of the American Gas and National Electric Light Associations, points out very convincingly that political subdivisions which enter into business enterprises do so not in the exercise of their governmental functions but merely in their proprietary capacity. In support of this contention he quotes numerous judicial decisions from which he is justified in concluding: "These decisions clearly establish that when a municipality or other governmental agency undertakes to operate a public utility, it is acting in its proprietary and not its governmental capacity. In so doing it discards its governmental functions to that extent and is taxable on that business in the same manner as the ordinary individual. Any bonds issued for the sole purpose of financing such public utilities are issued by a municipality, not in its capacity as an agent of government, but in its capac-

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* Excerpt Leslie Vickers, "Unjust Federal Tax Exemption—Municipalities as Owners of Utilities, exercising Proprietary and Not Governmental Rights, Have an Unfair Advantage Which Forces Others to Pay for What They Enjoy," *Aera*, XV-1 (February, 1926), 16, 17.

ity as a private property owner, and as such become subject to Federal taxation."

A striking decision in this connection is that of Judge Sanborn in the case of Omaha Water Company *v.* City of Omaha,[1] . . .

> A city has two classes of powers, the one legislative or governmental, by virtue of which it controls its people as their sovereign, the other proprietary or business, by means of which it acts and contracts for the private advantage of the inhabitants of the city and of the city itself. In the exercise of powers which are strictly governmental or legislative, the officers of a city are trustees for the public, and they may make no grant or contract which will bind the municipality beyond the terms of their offices because they may not lawfully circumscribe the legislative powers of their successors. But in the exercise of the business powers of a city, the municipality and its officers are controlled by no such rule and they may lawfully exercise these powers in the same way and in their exercise the city will be governed by the same rules which control a private individual or a business corporation under like circumstances. In contracting for the construction or purchase of water works to supply itself and its inhabitants with water a city is not exercising its governmental or legislative, but issuing its business or proprietary powers. The purpose of such a contract is *not to govern its inhabitants but to obtain a private benefit* for the city and for its denizens.

Another court, in discussing the question as to whether municipal railways were beyond the reach of the taxing power of the United States said:

> It is no part of the essential governmental functions of a state to provide means of transportation, supply artificial light, water and the like. . . . For the purpose of taxation they stand upon the same footing as other private corporations upon which special franchises have been conferred.

Numerous supporting opinions which have been rendered by courts in different parts of the country seem to place the matter beyond all question. . . . If Congress can be brought to recognize the distinction between purely governmental and business functions, and to assert that political subdivisions which own or operate public utilities must be brought under the rules which govern private owners or business corporations, then the way will be clear for the elimination of a practice that is grossly unfair and which permits and encourages serious tax discriminations. . . .

[1] 147 Fed. 1, 1906.

109. Tax Relief for Electric Street-Railways *

Special Electric Railway Taxes. Electric railways are usually subject to imposts and burdens of a specialized character. They include payment for and maintenance of paving in connection with railway trackage, removal of snow, street cleaning and sprinkling, contributions toward the maintenance of traffic officers, and street lighting. Free transportation may also be required for policemen, firemen, and sometimes for other city employees not in uniform. Occasionally, too, mail carriers are carried free of charge. The extent of these special taxes usually varies with the respective trading abilities of the railways and municipal officers who conduct the franchise negotiations. At times municipal officers go to the extreme in embodying special requirements in franchises covering electric railways. This has been particularly typical of the street paving requirements.

Street Paving. The matter of paving requirements is primarily important and involves such a peculiar misunderstanding on the part of the public that further consideration is justifiable. Since horses ceased to supply the motive power for urban transportation, and regulation came into effect, paving charges often have imposed an unjust burden on this type of transportation. . . .

In some cases these paving requirements have been continued on the theory that the franchise right granted by the municipality enabled the company to earn large returns, and that the city merely relieved itself of certain expenses in return for the privilege granted the railway company. Under regulation no such value is given franchise rights. Carriers are limited to a fair return, but are permitted to capitalize the cost of paving, to earn a fair return thereon, and to set aside out of gross revenues, an amount sufficient for maintenance and ultimately for replacing the pavement. Under this practice the electric railways are allowed to include an expense in their charge for service which otherwise would be borne by the adjacent property owners or by the municipality itself. The property owners not only are likely to benefit from such paving but also the ''jitneys'' which freely use the streets and in turn deprive the railway companies of revenue. . . .

A special committee of the American Electric Railway Association was . . . appointed to investigate electric railway taxation and report to the Association. The data which this committee obtained covering the year 1922 show that the electric railways of the United States pay approximately $100,000,000 in taxes, or about 10 per cent of their total revenue.[1] About two-thirds of the taxes paid by electric railways are derived from property and income and are similar to those paid by other corporations, while the remaining one-third are franchise, earning, and other taxes of a special nature. It, therefore, appears that special taxes comprise a rather large proportion of the total combined taxes paid by electric railways, and are in excess of those paid by the ordinary business corporation. The taxes levied upon the resources of the electric railways in the recent unfavorable years have been burdensome. In 1922 these companies in New York State paid 45 per cent of their net income in taxes.[2] In Virginia the tax amounted to nearly 40 per cent.[3] The electric railways have been subjected to more extensive special taxes than any of the other classes of public utilities.

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* Excerpts from M. C. Waltersdorf, *National Municipal Review*, XVII (June, 1928), 321-325.

Shifting the Utility Taxes. Apparently the public does not appreciate the fact that public utilities merely serve as collectors of taxes. Special or discriminatory taxes levied upon electric railways or other utilities are shifted to the customers of the service. Utility taxes are not paid by the utility owners, but rather by the patrons. The car-rider of moderate means helps to pay for the paving of the streets which his more prosperous neighbor uses with his automobile. The rapid increase in the number of automobiles has further led to such traffic congestion of the streets as to slow down the transportation speed, thus tending to increase the cost of electric railway service which the car-riders must support. The patron of the traction company not only pays for the cost of his transportation, but he is required to contribute an additional sum to pave and keep in repair portions of the streets which are largely used by those who generally employ other means of conveyance. Students of this subject do not contend that electric railways should be relieved of the entire cost of street paving, because certain of the costs are peculiar to street-railway construction, and are properly chargeable to these companies as are also certain of the maintenance expenses. In too many instances, however, a disproportionate part of the total paving expense is placed upon the company which, consequently, is shifted to the patron of the railway service.

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[1] American Electric Railway Association, *Proceedings*, 1923, p. 200.

[2] F. M. Davenport, "The Taxation Problem," *Aera*, XII (March, 1923), 911.

[3] A. Forward, "Taxation in Virginia," *Aera*, XII (March, 1923), 920.

Frequently it is assumed that car-riders actually do not pay for this expense, and, therefore, the burden should not be transferred to the taxpayers. This contention is based on the idea that such charges are really paid by the stockholders because of their willingness to accept a lower rate of return. Perhaps in some particular city an electric railway is unable to charge a fare high enough to cover the full cost of the service, including paving charges. Under such circumstances it would appear that the stockholders and not the car-riders pay for the burden. However, as a rule, when a public utility earns an inadequate return through no fault of its own, it naturally tries to increase its return in every practicable way. It will perhaps furnish only a minimum amount of service, it may fail properly to maintain its equipment, and it also may neglect to make the necessary extensions and improvement of its system which the community growth demands, and which a more liberal return would permit. Obviously the car-rider does not escape. The burden imposed upon him by such an expense has merely been changed from an excessive fare to inadequate and unreliable service.

Tax Exemption. Some students of the problem of taxation maintain that public utilities should be exempt from all taxation because any taxes imposed upon them are ultimately shifted to their customers. Such a view obviously is not consistent with modern methods of utility operation, which assume that all the necessary cost of rendering the utility service, but no more, should be paid by those using it. If all the utilities, including street-railways, were tax-exempt, this loss of revenue would necessitate the imposition of a heavier tax burden upon other taxable property or agents; and non-users of the utility service would be burdened with a charge that should be properly met by the utility patrons.

Street-railways contend that they should not be required to pay greater taxes on property which, although located on the public streets, causes no more obstruction than other property or traffic. Free or reduced service, cleaning, sprinkling, and paving of streets, and any other such special service imposes upon these utilities a tax which is shifted to the users of the transportation service. Costs of this character which benefit the public in general should largely be covered by general taxation, while those costs which are of a character properly assignable to the electric railway service should not be borne by the taxpayers in general, but rather by those who benefit directly from the service. Street-railways should pay all equitable taxes levied upon their property, but should be relieved of such burdens as add nothing to their service and which benefit the public and other agencies of transportation. Since the patron of the utility service in all cases pays the burden, he should be required only to pay for that cost which in equity is directly assignable to the service which he uses. . . .

110. The Comparative Tax Burdens of Public Utilities *

In the public service field, two developments in public policy, entirely aside from recent increases in taxation, have created the necessity not so much for agitation, but for careful scientific study and statistical analysis to a degree that has not existed hitherto.

The first is the gradual abandonment, both in theory and in legislation, of the idea that some special tax policy must be applied to public service industries, as distinguished from the general tax policy under which other industries are taxed. . . .

The remarkable development of public service industries . . . to a point where they now represent a total value of close to 40 billions of dollars, or one-eighth of the estimated total wealth of the country, has removed the occasion for exemption or other governmental favors on the one hand, and on the other the development of public regulation has removed the necessity for resorting to taxation for the recovery of excessive profits that no longer exist. . . .

TABLE 53

Taxation of Street and Electric Railways—United States

Ratio of Taxes to Designated Items Expressed as a Percentage

Item	1902	1907	1912	1917	1922
Gross Receipts	5.22	4.60	5.98	6.27	6.18
Operating Revenue	5.25	4.72	6.14	6.43	6.35
Net Operating Revenue..	12.43	11.84	14.93	17.79	22.42
Gross Income	12.09	11.07	13.84	16.49	20.17
Net Income before Taxes	29.95	32.87	33.95	44.77	53.19
Corporate Net Income...	42.75	48.97	51.41	81.06	113.64
Dividends	82.35	74.68	67.82	94.66	.....
Total Expenses	5.95	5.07	6.76	6.79	6.53

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* Excerpts from Herbert D. Simpson, "The Taxation of Public Service Industries—a Preliminary Report," *The Journal of Land and Public Utility Economics,* I (1925), 44-59.

The second development, which has made investigation both more necessary and more difficult, is the changed incidence of public utility taxation in consequence of the development of effective regulation. In private industry some taxes, such as net income and profits taxes, can be shifted little, if at all, by the corporations or individuals on whom they are levied; other taxes are shifted down a long ''waiting list'' and finally spread in varying proportions over stockholders, consumers, and other groups, depending upon the nature of the demand, conditions of competition, and other factors. Under regulation, taxes are included in the calculation of expenses, and rates are fixed which it is intended, at least, will yield a revenue sufficient to cover expenses and a fair return upon the property; and however far regulation sometimes falls short of providing the fair return, it seldom fails to cover expenses—which means that taxes, along with other expenses, are thus made a direct charge upon the consumers of the industry.

If this sounds theoretical, one has but to read the decisions of the courts and the reports of commission proceedings in rate cases. The Ohio Public Utilities Commission, for example, will be found figuring taxes down to the cost per ton of hauling coal from Nelsonville to Toledo, as follows:

Line haul and assembling	51.294 cents
Excise tax	3.20
Other taxes	1.5
Rentals	1.11
Switching charges	7.28
Total	64.384

and on the basis of these figures calculating a profit of 15.62 cents per ton as necessary to yield a fair return upon the investment, and establishing a rate of 80 cents.[1] The reasoning of the commission makes it clear that if the ''excise tax'' had figured out 1 cent instead of 3.20, the freight rate on coal over the Hocking Valley from Nelsonville to Toledo would have been 78 cents, or some such figure, instead of 80 cents.

The Missouri Public Service Commission likewise, in 1918, not only calculated the tax-cost of electric current on a kilowatt-hour basis but considered seriously whether a still more flexible provision might not be necessary to meet sudden changes in the amount of taxes, concluding:

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[1] *District No. 6, United Mine Workers of America* v. *Akron, Canton and Youngstown Ry. Co. et al.*, Ohio Public Utilities Commission, Case No. 571, June 23, 1916.

> However, the commission does not believe that the price of wages and the item of taxes will be subject to such sudden and radical changes that it cannot be provided for in the nature of a fixed charge per kilowatt-hour.[2]

Two years later a United States court attached even the federal income tax to the gas meter with the following computation:

> These figures would become, for each 1,000 feet of gas, as follows:

	6 PER CENT	7 PER CENT
Including franchises	.0216	.0252
Excluding franchises	.0192	.0224

> These figures must clearly be allowed.[3]

And in 1922 Mr. Justice Brandeis, speaking for the United States Supreme Court, laid down as a general principle:

> In calculating whether the 5-cent fare will yield a proper return, it is necessary to deduct from gross revenue the expenses and charges; all taxes which would be payable if a fair return were earned are appropriate deductions. There is no difference in this respect between state and federal taxes, or between income taxes and others.[4]

A year later, the Texas Railroad Commission quoted this decision and went a step further by specifically enumerating even "excess profits taxes" among the charges to be considered in fixing rates.[5]

Since the Galveston decision and the reaffirmation of that ruling by the same court a year later,[6] the principle laid down by the Supreme Court has generally been followed by the state commissions, even where that involves the reluctant abandonment of a position previously taken by many commissions.[7]

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[2] Missouri Public Service Commission *re Union Electric Light and Power Co.*, Nos. 1395, 1396, July 1, 1918.

[3] *Consolidated Gas Co. of New York* v. *Newton*, 267 Fed. 231; affirmed 258 U.S. 165. 1921.

[4] *Galveston Electric Co.* v. *Galveston*, 258 U.S. 388. 1922.

[4] *San Antonio Public Service Co.* v. *City of San Antonio*, 259, P.U.R.-1924 A.

[6] *Georgia Railway and Power Co. et al.* v. *Railroad Commission of Georgia*, 262 U.S. 624 (1923).

[7] For example, Pennsylvania Public Service Commission, *City of Philadelphia et al.* v. *Philadelphia Rapid Transit Co.*, 190 P.U.R. 1923E, June

An interesting example of a dual personality, legally speaking, obliged to consider the question of incidence from the standpoint of both regulation and taxation at the same moment, is afforded by a report of the Nevada State Board of Equalization. The chairman of the Public Service Commission, being in Nevada an ex-officio member of the Tax Commission, and in this case chairman of the committee, reported:

> To raise the assessment to $87,000 plus will increase the taxes approximately $2,000, which must be added to expenses and therefore must be taken care of in the rates to be charged to the public. The committee recommends that this assessment be reduced.[8]

Here we have a working model of the incidence of taxes upon rates in the hands of a committee that has power over both.

It was left for the West Virginia Public Service Commission only to supply an ethical basis for the above incidence of taxes:

> It is the duty of these patrons to contribute to the defendant company a sufficient amount of revenue to pay operating expenses and taxes.[9]

Probably no one will question the fairness of the above treatment of taxes (except in the case of net income and profits taxes, where there is considerable room for question),[10] but it might be said likewise that it is the duty of the "patrons" of agriculture and of other industries to contribute to the "defendants" a sufficient amount to pay operating expenses and taxes. The difference is that in regulation we have created official machinery for reminding patrons more or less effectively of this "duty," and

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21, 1923; North Dakota Board of Railroad Commissioners *re Northern States Power Co.*, 325 P.U.R. 1924A, Sept. 29, 1923; California Railroad Commission *re Coast Counties Gas & Electric Co.*, 415 P.U.R. 1924C, Oct. 27, 1923; District of Columbia Public Utilities Commission, *Federation of Citizens' Associations* v. *Chesapeake and Potomac Telephone Co.*, 152 P.U.R. 1924D, May 1, 1924.

[8] Mimeographed copy of Report of the Committee, before the State Tax Commission, Sept. 4, 1923, by courtesy of J. F. Shaughnessy, chairman of State Public Service Commission. Perhaps it should be added that the reduction recommended by the committee was a reduction not from a previous assessment but from a proposed increase in assessment.

[9] *Meade Coal Co.* v. *Appalachian Power Co.*, 221 P.U.R. 1923E.

[10] The treatment of net income and profits taxes by regulating commissions is still not entirely uniform, some commissions, even since the Galveston decision, holding that income taxes are not properly deductible in arriving at net income for purposes of determining a fair return. See example, State Corporation Commission of Virginia *ex rel. Newport News* v. *Newport News Light and Water Co.*, 91 P.U.R. 1923D, March 21, 1923.

therein lies a fundamental difference in the incidence of taxation in regulated and unregulated industry.

Of course, there are occasions when one "can lead a horse to water, but can't make him drink," and conditions under which the power, even of the most centralized authority, to levy taxes through the medium of regulation is limited by its inability to make higher rates effective in the form of net profits. In the case of the electric railways particularly, many grounds have been advanced for believing that taxes cannot be shifted—the customary 5-cent fare, motor competition, public opposition to rate increases and other factors.[11] But most of these conditions peculiar to the electric railway field are now in process of being modified or controlled; and only indicate, in any case, the difficulty of securing rate increases to compensate for increased expenses of any kind, not merely taxes.

All this is meant to assert here is that taxes now have the same judicial and administrative status in rate-making as other expenses; in short, that instead of taxes being distributed under the influence of random and varying conditions, to be sure, but still more or less widely over various participating classes, we now have "regulated" incidence as well as regulated rates and service.[12] . . .

In an effort to contribute something further to a knowledge of the problem (of public utility taxation) particularly on the basis of the facts as they exist in Wisconsin, the Institute for Research in Land Economics and Public Utilities has for some time been making a study of the taxation of public service companies throughout the United States.

The statistical portion of this study has been based chiefly upon:

1. Census and Interstate Commerce Commission reports; reports and bulletins of the Comptroller of the Currency, the Federal Reserve Board, and the Bureau of Agricultural Economics.
2. The published statistics of state tax and public utility commissions.

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[11] See papers and discussion of mid-year meeting of American Electric Railway Association, Washington, D. C., Feb. 16, 1923, published in *Aera*, XI (March, 1923), 911-925.

[12] Federal, State and local taxes paid by the gas industry amount to approximately $1.00 for each of the 70,000,000 users of gas in the United States according to George B. Cortelyou, president of the Consolidated Gas Company of New York. The revenue of the gas industry is about $700,000,000 annually, of which 10 per cent is paid out by the companies in taxes.

3. Unpublished Wisconsin materials, including railroad and public utility reports to the State Railroad and State Tax Commissions, reports to the State Banking Department, corporate income tax returns of firms and individuals to county assessors. . . .

Table 53 presents condensed income data expressed as a percentage to taxes for all operating electric railways in the United States. It may be questioned whether the ratio to gross receipts or to operating revenue best measures the tax burden in terms of a "gross-earnings" tax. If taxes reported by the companies actually include only "taxes assignable to railway operations," operating revenue should, of course, be the basis of comparison. There is reason to believe, however, from the form of the census schedules and the nature of some of the items, that the tax item sometimes includes taxes on the property or business from which "non-operating income" is derived. For this reason and also for the reason that in some states, as in Ohio, gross earnings taxes upon public utility corporations are construed to apply to earnings from all business transacted, whether in connection with the public utility service or not, we shall use the gross receipts ratio in most of our subsequent comparisons, although the effect will be to understate somewhat the tax ratio in terms of a gross earnings tax, as that tax is construed in most of the states that employ it.

Taxes in terms of gross receipts reached the minimum in 1907 and the maximum ten years later. The striking feature is the comparatively slight increase of the gross receipts ratio, the three periods prior to the war averaging 5¼ per cent, the two periods after the war 6.22 per cent, an increase of only 18 per cent, and an increase of a fraction under 20 per cent for the entire period from 1902 to 1922.

The ratio of taxes to operating revenue represents the burden of taxation on the consumers—not the amount of taxes shifted to the consumer, to be sure, since the ratio of taxes to operating revenue shows nothing with respect to changes in the rate of fare in consequence of the application of the tax, but the number of cents the car-rider pays to the government out of every dollar's worth of street-car fares purchased. In 1902 this was 5.25 cents; in 1922, 6.35 cents.

The burden of taxation upon the property as a whole, regardless of the division of burden among the various equities concerned (stockholders, bondholders and other creditors, lessors, and the government), is measured by the ratio to gross income, which reflects an income of 67 per cent.

The burden upon the stockholders, as one group of taxpayers, is measured by the ratio to net income before taxes, which represents the government starting with 30 per cent in 1902 and "buying into" the property through the medium of taxation until, in 1922, it held the position of a "majority stockholder," taxing 53 per cent of all income after expenses and charges. The figures appear to suggest some discrepancy between the process of incidence described above and the results here indicated, a discrepancy which is to some extent only apparent but to some extent actual; and we shall not attempt at this point to explain the differences or to reconcile the law and statistics, both of which have their limitations.

The tables at once raise the question whether in considering electric railway taxation, we are thinking of the electric railway business, of electric railway property (as measured by the entire "net earnings" available for distribution and ordinarily reflected in the market value of the securities) or of electric railway income, in the sense of business profits to the stockholders. Taxation of the electric railway business shows only a very moderate increase; taxation of electric railway property, in the sense of the entire ownership, shows a very considerable but not abnormal increase; taxation of electric railway income has risen to a point which subjects electric railways to a rate (53 per cent) higher than the maximum normal and surtax taxes combined of our present federal income tax.

From the stockholder's standpoint the question in turn presents itself whether this situation has been brought about by a change in his taxes or in his income; that is, an increase in his taxes or a decrease in his income. It is apparent that the nether millstone of taxes remains relatively fixed; it is the upper millstone of "other expenses" that keeps grinding relentlessly upon the slender grist of net income remaining.

Here taxes absorb only a slightly increasing proportion of operating revenue; it is the steadily sinking stratum of net income on a substratum of rigidly fixed taxation that portends trouble.

Before drawing conclusions it will be helpful to compare these facts with the trend of taxation in other groups of public service industries. Limitations of space make it necessary to omit the original data and present here only the percentage results.

Table 54 records the history of railroad taxation since 1900 *

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* Table reduced in this excerpt to summary of five year intervals.

Taxes in terms of gross receipts reached their lowest point at about the same time as in the case of the electric railways, in the period 1903-1907, but rose almost uninterruptedly to a peak in 1922. Railroad taxes, by all measures, show a more striking increase than electric railway taxes, apparently because they began on a much lower level, but still stand in 1922 below the level of electric railway taxes by every measure except the ratio to net operating revenue (which reflects the higher operating ratio of the steam roads), and the ratio to gross income (which likewise reflects the operating ratio modified by a slightly higher proportion of non-operating income on the part

TABLE 54

TAXATION OF STEAM RAILROADS

Ratio of Taxes to Designated Items Expressed as a Percentage

	1902 [b]	1907 [b]	1912 [b]	1917 [a]	1922 [a]
Gross Receipts	2.83	2.79	3.58	4.99	5.18
Operating Revenues ...	3.15	3.10	3.95	5.45	5.51
Net Op. Revenue	8.93	9.55	12.94	18.49	26.78
Gross Income	6.75	7.13	9.97	14.56	20.49
Net Income before Taxes	16.27	15.16	21.46	26.96	45.19
Corp. Net Income	19.43	17.87	27.32	36.92	82.45
Dividends Paid	29.38	26.07	32.19	68.33	112.72
Total Expenses	3.32	3.31	4.12	5.77	5.52

[a] Calendar years. [b] Fiscal years.

TABLE 55

TAXATION OF TELEGRAPH COMPANIES IN THE UNITED STATES

Ratio of Taxes to Designated Items Expressed as a Percentage *

ITEM	1902	1907	1912	1917	(WESTERN UNION TEL. CO.) 1922	1922
Gross Receipts	1.44	1.72	2.01	4.40	4.64	4.5
Operating Revenue	1.67	1.99	2.16	4.48	4.72	4.7
Net Operating Revenue.	6.76	20.30	16.63	20.91	22.27	20.5
Gross Income	4.11	7.76	10.51	19.29	20.72	17.8
Net Income before Taxes	5.57	11.72	24.81	25.23	30.83	22.4
Corporate Net Income..	5.90	13.27	33.00	33.74	44.57	28.9
Total Expenses	1.90	1.97	2.14	5.06	5.18	5.4

* Based on Census Reports, *Telephone and Telegraphs*, 1902 and 1907; *Census of Electrical Industries—Telegraph.*

TABLE 56

TELEGRAPH COMPANIES' TAXATION

(Interstate Commerce Commission Reports)

	1922	1923	1924	1925	1926
Taxes/Gross Receipts	4.2	4.1	3.8	3.7	3.7
" /Operating Revenue	4.3	4.2	3.9	3.8	3.7
" /Net Operating Revenue.....	20.4	22.0	21.5	20.5	21.6
" /Gross Income	18.8	20.1	19.4	18.6	20.1
" /Net Income before Taxes...	24.5	26.5	26.4	24.5	26.8
" /Corporate Net Income......	32.4	36.1	36.0	32.4	36.7
" /Total Expenses	4.8	4.6	4.3	4.2	4.1

TABLE 57

TAXATION OF TELEPHONE COMPANIES

Ratio of Taxes to Designated Items Expressed as a Percentage *

ITEM	1902	1907	1912	1917	1922 [a]
Gross Receipts	3.39	3.52	4.87	6.50	7.14
Operating Revenue	3.61	3.77	5.09	6.64	7.34
Net Operating Revenue..	9.57	9.12	16.24	22.21	26.19
Gross Income	8.18	8.00	14.12	20.72	23.77
Net Income before Taxes	11.97	13.10	19.47	28.90	32.62
Corporate Net Income...	13.59	15.07	24.18	40.66	48.41
Dividends	19.65	26.18	36.38	57.14	70.87
Total Expenses	4.52	4.59	6.09	7.73	8.37

[a] All companies with revenues of $10,000 or over.

of the steam roads). The general trend, however, is very similar, with taxes in 1922 taking slightly less than half of all the income available after expenses and charges in the case of the steam roads, and slightly more than half in the case of the electric railways.

Table 55 presents the taxation of telegraph companies in 1917, the latest Census data available at the time of writing. Income and tax data for the Western Union Telegraph Company for 1922 are appended for purposes of comparison.[13] The striking

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* Compiled from Census Reports, "Telephones," 1907, 1912, 1917 and 1922. Commercial and Mutual Companies, with revenues of $5,000 or over.

[13] The Western Union Telegraph Company represented 76 per cent of operating revenue of all telegraph companies reporting to the Interstate Commerce Commission in 1922. Statistics of Railways, *Interstate Commerce Commission Report*, 1922, p. cx.

fact here is the low level of taxation at the beginning of the period (equivalent to a gross receipts tax of 1½ per cent in 1902), the rapid rate of increase since that time, and the fact that even with that rapid increase telegraph companies were still less heavily taxed in 1917 than electric railways by all measures except net operating revenue and gross income.

TABLE 58

Telephone Companies' Taxation

(American Telephone and Telegraph excluded[a])

	1922	1923	1924	1925	1926
Taxes/Gross Receipts	7.0	7.1	7.1	7.4	8.1
“ /Operating Revenue	7.2	7.3	7.3	7.6	8.3
“ /Net Operating Revenue	27.7	28.4	27.9	26.4	27.2
“ /Gross Income	24.0	24.9	25.1	24.4	25.4
“ /Net Income before Taxes	34.0	35.5	36.0	33.6	33.4
“ /Corporate Net Income	51.6	55.1	56.3	50.6	50.1
“ /Dividends	64.6	62.7	60.1	61.5	63.0
“ /Total Expenses	8.0	8.1	8.2	8.7	9.7

[a] The Census omits inter-company items. Therefore by excluding American Telephone and Telegraph data, the Interstate Commerce Commission figures are closely comparable.

TABLE 59

Taxation of Electric Light and Power Companies

Ratio of Taxes to Designated Items Expressed as a Percentage *

Item	1902	1907	1912	1917	1922
Gross Receipts	3.37	3.93	4.70	6.14	7.4
Operating Revenue	3.43	4.07	4.96	6.46	7.8
Net Operating Revenue	8.69	9.31	11.82	16.77	16.7
Gross Income	8.31	8.60	10.45	14.77	15.0
Net Income before Taxes	14.31	14.39	17.60	24.63	22.1
Corporate Net Income	16.70	16.81	21.37	32.67	28.4
Dividends	42.89	32.88	37.93	46.29	56.6
Total Expenses	4.23	5.12	6.03	7.57	10.0

Telephone company taxes in Table 57 reflect heavier taxation in terms of gross receipts and total expenses than any of the

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* Compiled from Bureau of the Census, *Central Electric Light and Power Stations, Commercial Companies.*

groups thus far shown and taxation in terms of net income heavier than that of telegraph companies but distinctly lower than in the case of either electric railways or steam roads.

The contrasts in the taxation of electric light and power companies in Table 59 are interesting and more or less characteristic of the differences in burdens among the different groups of utilities.

Electric light and power company taxes began at a lower level, measured by every norm, and crept up until in the last year of comparison available (1917) they approximately equaled those of electric railways in terms of gross receipts and total expenses. In fact, the taxes in the two fields are very similar through gross receipts, net operating revenue, and gross income. The sharp difference in burden from there on reflects largely the differences in capital structure—interest and other charges absorbing 24½ per cent of the operating revenue of electric railways and only 17½ per cent of operating revenue of electric light and power companies.

It should be kept in mind, however, that in the Census tabulations the railway data and electric light and power data of joint-service companies are not entirely segregated. Instructions to agents and reporting companies are, where possible, to make complete separate reports for the two services; where this is not possible, combined reports are made; so that the railway tabulations include some light and power service, and the light and power tabulations do not include all the light and power services of joint-service companies.

Two industries of national scope, outside of the public service field, which afford materials for immediate comparison are banking and agriculture.

Table 60 presents some comparable data for national banks; Table 61 for the state banks and trust companies in the Federal Reserve System. The outstanding features of the two tables are the relative steadiness of the gross earnings ratios, their general similarity to the corresponding ratios of public service companies, and the materially lower tax burden as measured in income.

Table 62 presents some limited but interesting data on farm taxes, based on materials collected by the United States Department of Agriculture and recast into form as nearly as possible comparable to the public service and banking data already presented. The only change made in the original data is the

TABLE 60

TAXATION OF NATIONAL BANKS

Ratio of Taxes to Designated Items Expressed as a Percentage *

ITEM	1918	1919	1920	1921	1922	1923	1924	1925	1926
Gross Earnings	6.51	7.14	7.17	7.27	7.44	6.42	6.2	5.9	5.8
Total Expenses [a]	8.87	9.70	9 61	8.87	8.98	7.97	7.5	7.3	7.3
Net Income	24.47	27.06	28.18	40.44	43.22	33.13	33.9	29.4	27.5
Net Income before Taxes	19.66	21.30	21.98	28.80	30.18	24.88	25.3	22.7	21.6
Dividends	40.03	47.98	53.78	55.26	47.85	37.62	40.5	39.9	39.5

[a] Adjusted for losses and recoveries on "Charged-off Assets."

* Calculated on basis of Reports of Comptroller of the Currency for years 1918-1923. Figures are for fiscal years.

TABLE 61

TAXATION OF STATE BANKS AND TRUST COMPANIES

Ratio of Taxes to Designated Items Expressed as a Percentage *

ITEM	1919	1920	1921	1922	1923	1924	1925	1926	1927
Gross Earnings	5.84	5.24	5.69	5.93	5.04	4.9	4.8	4.8	4.8
Total Expenses [a]	7.75	6.91	7.17	7.34	6.49	6.2	6.1	6.2	6.2
Net Income	23.61	21.65	27.55	30.93	22.55	23.0	22.3	20.4	21.0
Net Income before Taxes.........	19.10	17.80	21.60	23.62	18.40	18.7	18.2	16.9	17.4
Dividends	39.83	39.12	44.34	44.56	34.76	35.2	36.0	35.7	35.4

[a] Adjusted for losses and recoveries on "Charged-off Assets."

* Based on Federal Reserve *Bulletins*, 1919-1924. Includes only members of Federal Reserve System. Figures are for fiscal years.

TABLE 62

TAXATION OF FARMS *

ITEM	AVERAGE RECEIPTS AND EXPENSES PER FARM REPORTING					RATIO OF TAXES TO DESIGNATED ITEMS EXPRESSED AS A PERCENTAGE				
	1922	1923	1924	1925	1926	1922	1923	1924	1925	1926
Number of Reports..........	6,094	16,183	15,103	15,330	13,475	....	....	....	....	....
Average Size of Farms (Acres)	255	300	303	304	315	....	....	....	....	....
Average Value of Farm, Real Estate and Personality.....	$16,430	$17,490	$17,260	$17,122	$16,308	....	....	....	....	....
Gross Receipts:										
Cash Sales	1,972	2,240	2,434	2,551	2,448	....	....	....	....	....
Food and Fuel............	294	250	266	274	282	....	....	....	....	....
Rental Value of Home.....	240	240	184	184	184	....	....	....	....	....
Increase in Inventory......	150	64	181	223	158	....	....	....	....	....
Total...................	$ 2,656	$ 2,794	$ 3,065	$ 3,232	$ 3,072	6.55	6.80	6.3	5.9	5.9
Expenses:										
Cash Outlays	1,083	1,160	1,218	1,286	1,290	....	....	....	....	....
Labor of Owner and Family	716	870	789	793	779	....	....	....	....	....
Interest	230[a]	230	230	225	215	....	....	....	....	....
Total (before Taxes).....	$ 2,029	$ 2,260	$ 2,237	$ 2,304	$ 2,284	....	....	8.6	8.3	8.0
Net Income before Taxes.....	627	534	829	928	788	27.75	35.58	23.2	20.6	23.2
Taxes	174	190	192	191	183	....	...	....	....	....
Net Income	$ 453	$ 344	$ 637	$ 737	$ 605	38.41	55.23	30.2	25.9	30.2
Total Expenses	2,203	2,450	2,429	2,495	2,467	7.90	7.76	7.9	7.7	7.4

[a] Interest was not reported in 1922, and we have substituted that item as reported for 1923.

* United States Bureau of Agricultural Economics, Preliminary Report, "Returns from Farming on 6,094 Farms, 1922." Computed from Reports on 6,094 Individual Farms Operated by Their Owners? and "Farm Returns, 1923," in United States Department of Agriculture, Crops and Markets, July, 1924.

inclusion among farm receipts of an estimate of $240 for the rental value of the home.[14]

The average size of farms reporting is above the average for the United States and presumably represents somewhat more than the average prosperity for farms as a whole. The number reporting is likewise a very small sample and may or may not be representative of the agricultural situation in general.

The striking features of the tabulation are the low return on the investment, the absence of anything that could be called business profits, the similarity of the gross receipts ratio to the same ratio for the public service corporations, and the lower burden in terms of net income than in the case of either the railroads or the electric railways. The ratio of taxes to total expenses, however, runs materially higher than for railroads or electric railways and is presumably, as in the case also of the telephone and electric light and power companies, a reflection of low labor costs in the three industries—due largely to mechanical substitution in the case of electric light and power plants, access to inexpensive labor supply in the case of the telephone companies, and poor accounting in the case of the farms.

From all the tabulations thus far presented three facts stand out:

1. The striking similarity of the gross receipts ratios;

2. The extreme variations of the tax burden in terms of net income;

3. An apparently disproportionate burden of taxation upon electric railways, measured in net income. These results are brought together in Table 63, in which the groups are arranged in order of tax burden on net income. The figures for telegraph companies and for electric light and power companies for 1922 are not available at the time of writing. The tax ratios of the Western Union Telegraph Company for 1922 are included for the sake of comparison.

Here we have five groups of industries in 1922 paying an average gross receipts tax of 6¼ per cent, with no one of them varying more than 17 per cent from the average rate (the lowest—steam railroads—being 17 per cent below, and the highest, telephones—10 per cent above the average rate) and yet paying the equivalent of net income taxes varying all the way from

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[14] United States Department of Agriculture, *Bulletin No. 1214*, Jan., 1924, estimates rental value of homes in section surveyed at $234. Previous Department of Agriculture estimates run much lower.

26 per cent to 53 per cent. Strangely enough, the actual tax burden varies almost inversely with the gross receipts ratio, since these same groups arranged in order of gross receipts ratio would stand:

Telephones
Banks
Farms
Electric Railways
Steam Railroads

If the first column in the table were titled "Taxes" and the second "Tax Burdens," it might better suggest their real significance.

TABLE 63

COMPARATIVE TAX BURDENS—1922

ITEM	RATIO OF TAXES TO GROSS RECEIPTS	RATIO OF TAXES TO NET INCOME BEFORE TAXES
Electric Railways	6.18	53.19
Steam Railroads	5.18	45.19
Farms	6.29	31.4[a]
Telephones	6.83	27.28
Banks	6.69[b]	26.4[c]
Telegraphs	4.40 (1917)	25.23 (1917)
Western Union Telegraph Co.	4.64 (1923)	30.8 (1922)
Electric Light and Power	6.14 (1917)	24.63 (1917)

[a] Average 1922 and 1923.

[b] National banks 7.44, state banks and trust companies 5.93, averaged in ratio of gross earnings.

[c] National banks 30.2, state banks and trust companies 23.62, averaged as above.

The general objection to a gross earnings tax is its failure to take account of differences in operating conditions and in tax-paying ability as measured by net income; but it would be difficult to levy a tax with less flexibility of adjustment or with more indiscriminate results than those here indicated, particularly when it is recalled that the effects of the property and miscellaneous taxes that make up the greater part of the tax totals are here modified by the inclusion of one large element of income taxation, namely the federal corporate income tax. The amount of federal income taxes included in the above totals cannot, of course, be calculated simply by applying the federal tax rate to net income, since taxable net income and net income as reported here are not exactly the same things and since there is considerable lag between income tax payments and the corresponding income on which the taxes are paid. But at least an approximate reflection of the equilibrating effect of the federal income tax will be secured if we apply the federal income tax rate to the corporate net income of these groups as reported for 1922, deduct that amount from total taxes, and take the ratios of remaining taxes to net income. An application of this rough-and-ready method to the data for 1922 yields the following results:

TABLE 64

RATIO OF TAXES OTHER THAN FEDERAL INCOME TAXES TO NET INCOME BEFORE TAXES.

	PERCENTAGE
Electric Railways	47.0
Steam Railroads	39.7[a]
Farms	31.4[a]
Telephones	25.9
Banks	19.0

[a] The amount of federal income taxes paid on the earnings of farms reporting average net incomes of $453 and $334 must be negligible, and we have retained in the tabulation the same figures as in Table VIII.

Deprived of the equalizing effect of the federal income tax, the discrepancies in tax burdens stand out the more clearly, farms carrying a burden one and a half times to twice that of banks, and electric railways two and a half times that of the banks.

These facts alone certainly do not afford grounds for drawing any general conclusions; yet it is difficult in the face of them to avoid the feeling that the expensiveness, uncertainties, disputes, and litigation of a property and ad valorem system of taxes are largely wasted if this is the result of it all. A straight gross earnings tax—indeed a uniform gross earnings rate spread over all of these groups of industries could hardly be more inflexible and more violently regressive than our present methods, if the facts here presented are at all representative of conditions over a longer period of time.

111. Some Economic Aspects of the 1927 Tax Burden on Chicago's Street-Car Patrons *

Urban transportation is so vitally important to every one living in metropolitan areas that whenever it fails to be self-

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* Excerpt L. D. Jennings, *Journal of Land and Public Utility Economics*, IV (1928), 314-316.

supporting taxes are levied or other arrangements are made by the political unit to keep the wheels turning. Cheap, rapid, and adequate transportation service is beneficial not only to those who actually purchase transportation but to every one in the community. It enables the population to spread over a wider area, thus improving general living conditions; it enhances land values in suburban sections and in the central business district by furnishing easy communication for trade and business purposes; it makes it possible to maintain neighborhood relationships regardless of business contacts; it renders standby service for those who use private means of transportation or use the service only under exceptional conditions; it makes for more efficient mass transportation by attracting a large number of individuals who otherwise would use private vehicles; and it multiplies the possibilities of social contacts by providing a method for relatives and friends to reach one's door without undue inconvenience and expense. Yet despite these services to the entire community, the patrons alone bear the cost of transportation and make, in addition, a material contribution to meet the cost of government.

From the standpoint of the utility and its patrons the aforementioned services may be classified as indirect, since in themselves they create no additional expense and exist merely because of the fact that the company is organized and doing business in the particular community. Other services, however, which the utility may be required to render directly to the community require financial outlays on the part of the street-car riders. In addition to the annual contribution in the form of direct taxes such expenditures consist of furnishing paving for those who use the center of the streets; paying a part of the general street cleaning expense in addition to keeping their own route open; bearing the cost incident to filling and repairing excavations made across their tracks by the municipality; and supplying free transportation to those engaged in furnishing police and fire protection to the community.

In this connection the 1927 tax bill for the Chicago Surface Lines, related to revenue passengers, makes a very interesting study. During this period the company transported 876,249,663 revenue passengers at the average fare of 6.897 cents per ride. The total tax bill which these riders were called upon to pay amounted to $8,261,155.48 or 0.9426 cents (approximately one cent) per revenue passenger. This bill was itemized as follows:

TABLE 65

Tax Burden on Chicago Street-Car Patrons

Type of Tax	Amount	Cents per Revenue Passenger
1. General	$3,630,929.91[a]	0.4143
2. Free Riders	650,000.00[b]	0.0741
3. Paving	1,000,000.00[c]	0.1141
4. Street Cleaning	360,000.00[d]	0.0410
5. City's share of surplus earnings	2,620,325.57[e]	0.2991
	$8,261,155.48	0.9426

[a] Includes all of the general taxes as reported by the company.

[b] Free rides to police and firemen estimated as approximately one-fifth of the total free rides as estimated by the company checked for reasonableness by figuring two rides per day per city employee in this class.

[c] Paving cost estimated from the reports of the company in conference with an engineer with considerable experience in estimating track construction cost and includes all expenses of this nature such as filling excavations made by the city, etc.

[d] Street cleaning item is a flat payment to the city in addition to company's own cost of keeping its tracks clear.

[e] After 5 per cent is allowed on the agreed value of the property the city and company share the balance on the basis of 55 per cent to the city, and 45 per cent to the company according to the operating agreement of 1913.

From these figures we conclude that if the non-users, who receive benefits without paying their proportionate share of the costs, were to lift in some equitable manner the tax burden from the revenue passengers the fare could be reduced to six cents or, if the present fare were continued, the sum paid in taxes would, at 8 per cent, support an additional investment of $103,264,443.50[1] for improving and extending the service.

Taxes, therefore, consume approximately 15 per cent of the present Gross Revenues of the Chicago Surface Lines. The entire cost of the service is borne by the utility patrons who in many cases are paying close to what the traffic will bear. . . . In equity such costs as far as public utilities are concerned should be shared according to the benefit derived from the service, and the problem of urban transportation will not be solved until some recognition of these other factors is made on the part of the political authorities and the general public.[2]

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[1] This sum is approximately equal to two-thirds of the present agreed upon valuation of the properties of the Chicago Surface Lines which totals $163,745,856.06.

[2] The desirability of "painless extraction" of taxes (as $6.00 per year from regular patrons of the Surface Lines without their knowledge and reflecting entirely on the company and not on the political party in power) is a political question of merit which has not been considered. The public pays more easily this way even though it comes higher, but when this charge approaches what the traffic will bear, the economics of the question are properly opened for consideration.

CHAPTER X

THE VALUE OF PROPERTY AND PLANT

112. The Meaning of Valuation *

This is not a paper on the theory of value nor on the theory of rate making. It is essentially a study in the use of terms. What are we talking about when we speak of valuation? How did the idea of value originate and develop? Are there several kinds of value, or is there only one kind? To what sort of processes should we apply the name valuation and to what sort of processes should we apply the name assessment? What dangers or evils result from confusing the two concepts by giving them one indiscriminate name? . . .

An assessment is a charge, or basis of charges, fixed by constituted authorities for any purpose whatever. An administrative board may assess taxes, or assess the land which forms the basis of taxation. A court may assess damages for an injury. A club may assess its members to meet a deficit. The term is a general one meaning the fixing of prices by authority. And it has been specifically applied to the fixing of prices of public services by the magistrates. The most familiar example of price regulation in the Middle Ages was the assessment or, as it was then more commonly called, Assize of Bread.

The words value and valuation stand on quite a different footing. Value is based primarily, not on what government says, but on what people actually want, and actually do or are ready to do. Valuation, in the traditional meaning of the term, is an estimate of what people will pay for a given piece of property.

The conception of value is a comparatively modern one. Paradoxical as the statement may sound, the process of valuation had gone very far in its development before we began to define the term value. The genesis of the modern ideas of valuation can be traced back to the English courts of equity. In the common law courts the man who had broken or was trying to break a contract could be compelled to perform it. But what if conditions

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* Excerpts, Arthur T. Hadley, *American Economic Review Supplement*, XVIII (March, 1928), 173-180.

rendered such specific performance impossible? The complainant had only an "equitable" remedy at command. The defendant could be compelled to do something as nearly as possible equivalent to the damages occasioned by his failure. To make damages compensatory you had to value the loss and value the recompense as a means of securing justice.

Where could we find an objective standard for such valuation? In case of merchandise the answer was easy. We could go to the nearest market, find what price such merchandise commanded, and multiply that price by the amount involved. An award of this amount gave the complainant an inventory value which would make good his loss by enabling him either to purchase the same goods, or any other goods which commanded the same price that he happened to want more at the moment. The question of labor cost did not enter into this transaction except indirectly as one of the causes which affected the market price of the articles he owned or bought. What the courts emphasized as the basis of valuation was equivalence in purchasing power in a free market.

When it came to the valuation of an investment like a piece of improved real estate the procedure was different. Different pieces of improved land had an individuality of their own. It might happen that one piece of land, owing to natural advantages or to intelligent improvement, had a rental of five pounds sterling an acre, while another not far off had a rental of but one pound. In the case of fixing compensatory values for land the courts estimated as well as they could the net income from the land, and then found at what rate land with a given rent charge sold. In other words, they ascertained what was the capitalization rate of land held on long leases and fixed this as the basis of valuation of the estate. The use of this process of capitalization is very old, older indeed than the full legal recognition of interest itself. In fact there was a period when men who, like Balaam, wished to die the death of the righteous yet loved the wages of sin, used to justify themselves in taking interest by getting the borrower to create a real or fictitious rent charge on a piece of land and then buying the right to receive it. A relic of this still survives in the German word for interest, *zins*, which is a translation of the Latin *census* or rent charge.

This method of valuation in which we inventory merchandise at market price and land at a capitalized rental proved a good one for a great variety of purposes. If it was a question of damages it gave just compensation by furnishing an equivalent in purchasing power. If it was a question of taxation it furnished a basis of assessment which corresponded most closely to the ability to pay. The chief objection urged against it was that it overlooked the claims of the laborers who had produced the property to just compensation. But the efforts occasionally made to assess prices of merchandise on the basis of labor cost as recommended by Karl Marx, or prices of real estate investment on the basis of labor and capital cost, as recommended by Henry George, resulted either in encouraging the production of merchandise that was not wanted, or in discouraging the investment of new capital where it was wanted. In the latter part of the nineteenth century it was generally assumed that value, apart from some special qualifying adjective meant market value; as fixed directly for merchandise by competition in the produce markets, or indirectly for investments by competition in the money market.

But in the last thirty years we have discovered that a method of a valuation which was just in determining damages or arranging a basis of taxation, was of little use in fixing or regulating the charge for the services of railroads and electric companies. A certain rate or schedule of rates was complained of as unreasonable. If the company stated that their charges no more than paid interest on the value of the property, this was no answer at all; for the value of the property was itself a result of the rates charged. From this circle there appeared to be no logical escape. A demand arose for public regulation of rates; for an assertion of the right of the government to insist on reasonable charges and for a mode of assessment of the cost of the property which should serve as a rate base. This had resulted in a reopening of the discussion what value really meant and a reintroduction of the ideas of Henry George into the arena of debate.

In two respects the ideas of Senator LaFollette and his followers differed from those of Henry George. Mr. George would have applied his theories to all fixed investments in land. Mr. LaFollette confined them to public service corporations. Mr. George would have based the return on the historical cost of the property, *i.e.* the amount of labor and capital put into a piece of land. Mr. LaFollette, on the other hand, appreciated that the historical cost is a thing which we can seldom ascertain; and based his theory on duplication cost—cost of reproduction new minus depreciation. This he called physical value. This he regarded as the best objective standard that we have for regulating rates, and as one to which the owners of public service corporations are bound to submit themselves in the interests of the public.

In this view of the present situation there is some truth and some error. It is unquestionably true that a company holding a public franchise, and especially when that franchise creates a monopoly, must submit to regulation in the public interest. It is also true that the old method of valuation does not furnish us an independent rate base and leaves the way open for a legislature to prescribe a method of assessment of its own. On the other hand, it is doubtful whether the assessment of a rate base is the proper method of procedure in rate regulation; and it is quite certain that the attempt to apply the term valuation to the assessment of a rate base on duplication cost as a primary factor or to call the result of such assessment a value results in grave confusion of thought and many practical mistakes. . . .

Some say that there are different kinds of value, used for different purposes, and that cost of duplication gives a physical value for rate-making purposes. The answer to this is that physical value is a self-contradictory phrase which it is undesirable to use on every account. Value is not a physical phenomenon but a social one—not an inherent quality of objects, but a measure of their adaptation to social needs. It is wrong to take an old name which has had a fairly definite meaning and apply it to a new and self-contradictory concept.

Another group, intelligent enough to see that "physical value" is a self-contradictory and unmeaning term, admits that cost is not the same thing as value, but claims that it is a sufficiently good measure of value to warrant them in calling cost assessment by the name valuation.

But is it, in fact, a good measure? There are railroad lines in the country whose duplication cost will run up into many millions but whose value to any possible owner is measured, at the utmost, by a few hundred thousand. The theoretical value, measured by this standard, is more than a thousand per cent greater than the actual value. A measuring rod that registers such errors is worse than none at all. The most that can be said of cost assessment is that it may fix an upper limit beyond which value cannot go. And fixing an upper limit of value is a very different thing from creating or measuring it.

A third group is clear-headed enough to see this and admit frankly that duplication cost does not measure value as it is, but claims that it furnishes a standard of value as it ought to be, in the interest of the public. This group argues that the small producer or seller of merchandise has to be content with getting back the cost of his goods plus a reasonable profit, and does not get that unless he has managed his business prudently; and that the owners of large units of invested capital should be content, and must be content, to accept the same standard of just compensation—say 6 per cent on prudent investment—as the limit of their gains.

This argument has been widely accepted, in courts and public service commissions as well as in legislative debate. If it were really sound it would in my opinion justify us in calling an assessment of prudent investment cost a valuation. Therefore, at the risk of reiterating some things which most of us already know, I shall try to show why this reasoning is misleading in theory and bad in practice.

Why does the value of merchandise in a free market conform pretty closely to duplication cost, while that of fixed investments does not? Because merchandise in general is movable and is pretty easily used up, while fixed investments have to stay in permanent position and are used up very slowly if at all. The consequence is that if a man cannot sell his merchandise in one market where there is a glut, he takes it to some other market where there is a scarcity; and if for the moment there is no market where it is scarce he stops buying it or giving orders to the factory to produce it until the extra supply on hand is sold. The result is that prices of merchandise tend to conform to the cost with slight variations and in relatively short times. That means that there is a fairly close correspondence between cost of each individual article and the market price as fixed by demand. But in the case of a power plant or a railroad or even of a house that a man has built as an investment, there is no such correspondence. The owners have invested capital in land whence it cannot be removed without great loss. To induce them to take the risk of that loss they must have a chance for a corresponding gain if the investment succeeds. The price of all the houses in the country may very likely average somewhere near their cost of production. But the price of the individual house may vary much from this average. If any community was so impressed by Mr. George's theories that it passed a law fixing the price of a house on the basis of its cost of duplication, the building of houses stopped; because in case the owner had judged rightly as to location and demand, he was only allowed to get 6 per cent on his money, while if he had judged wrongly he had to bear the loss of a large part if not the whole of the principal.

The application of a similar method of "valuation" to American railroads has meant a repetition of the same mistake on a large scale. It began fifteen years ago. We can look over the results today. The construction of new lines has virtually stopped. There have been years when more were abandoned than constructed. Some companies have been unable to make improvements necessary to economy. Most others have had to run into debt, for there are very few companies that can sell new issues of common stock, and the creation of a preference is virtually running into debt. Meanwhile rates have risen as they always do when capital is discouraged from going into a progressive industry. Traffic which could more economically go by railroads if capital were given a fair chance is now going by automobile, overcrowding parking places in our cities and making things almost as uncomfortable for the automobile owner as for the railroad owner.

Such are a few practical results of the misapplication of the term value. When rightly applied it turns capital in the right direction. When wrongly applied it produces the opposite result.

This—if I may be allowed to pass for a moment from the immediate subject of my paper—is the reason why a rate-base assessed on cost is so apt to work badly. Unless the return allowed by the public service commission to successful companies is so high as to compensate for the risks of industrial progress—say 10 per cent at least—it discourages the investment of new capital. And a 10 per cent return to the successful company on what is popularly designated as its "value" is a thing which few commissions could openly allow—even if they saw that it was the only way to get the best service at the lowest rates, which most of them do not. Every first rate authority from Farrer down, I believe agrees that limiting profits, as a means for lowering rates, defeats its own end; but the temptation to save at the spigot and waste at the bunghole is almost irresistible when the public eye is fixed exclusively on the spigot.

Besides creating confusion in thought and error in practice, the attempt to use the same word for a true valuation and a cost assessment clouds our ideas of justice in a way that strikes at the very foundations of constitutional liberty. . . .

Assessment is the fixing of a price by government authority. It differs radically from value in the fact that it depends on public authority—not on public demand. It is essentially a political term—not a scientific one. We fix an assessment; we ascertain a value. We ascertain the value of a piece of property by the same process of observation and calculation that we use in ascertaining the weight of a mass of metal or the size of a piece of land. Value in the accredited sense of the term—to come back to Walker's excellent definition—is the power which an object confers on its possessor independent of political authority or personal sentiments to command the labor or products of labor of others. It is what an article is worth, sometimes in meeting an individual demand, more often in meeting a public demand, but it depends on demand in either case. Cost of production only enters into value indirectly by limiting the supply. A cost assessment neither produces value nor measures it.

113. The Definition of Fair Value from an Economic Point of View

A.* The relation between personal distribution and value furnished the basis for a definition of fair value. Value is the power that a good has in exchange. Fair value is the power that a good ought to have in exchange. The power in exchange that a good ought to have depends on the social consequences of that power. If the result is to direct human enterprise and to influence human choices so as to promote social well-being, value is fair. Since society is composed of individuals, this result depends on the manner in which wealth is distributed among the members of the group. If, therefore, wealth is distributed among the members of society so as to secure social well-being, value is fair.

Consequently, the problem of fair value may be summed up in the question, What sort of personal distribution will promote group welfare? The answer to this question depends on the nature of society and of social purpose.

B.† In analyzing the valuation problem as it affects the public service industries one is influenced primarily by his individual point of view. A lawyer or political scientist is biased by his underlying theory of regulation while economists differ on the standards of measurement and their effect on the cost of the service.

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* H. B. Whaling, *Fair Value—Economic and Legal Principles* (Bulletin of the University of Wisconsin, No. 923), p. 13; (*Economics and Political Science Series*, Vol. IX, No. 3), pp. 373-496.

† As interpreted by L. D. Jennings, Research Assistant in the Institute for Research in Land Economics and Public Utilities with acknowledgments to Barclay J. Sickler, Statistician of United Public Service Company—formerly of the Institute staff.

From a legal standpoint there are two theories[1] regarding the basis of the state's power to regulate public utilities. One contends that private enterprise is conducting a service which is essentially a state function, and therefore is to be considered as an agent entitled only to remuneration in accordance with expenditures prudently made in behalf of his principal. Others believe that these industries, which perform essential services under monopoly conditions, are private businesses subject to all the risks attached thereto and are regulated only to the extent necessary to protect the public from extortionate rates or monopoly abuses. Regulation under this theory is only for the purpose of creating substantially the same results which obtain under competitive conditions where value would tend to approximate the capital outlays of a competitor about to enter the field.

The agency theory sanctions prudent investment, the competitive theory favors the cost of reproduction, but agreement on legal principle will only partially solve the problem.

Prudent investment and cost of reproduction have different meanings depending on the standard of measurement and the weight given the various factors determining the cost of the service. Prudent investment is one thing in terms of dollars, another thing in terms of purchasing power which accounts for the changing value of the dollar, and still another in terms of the capital instruments employed in the public service. Likewise, cost of reproduction varies according to whether or not one has in mind the reproduction of the plant or the reproduction of the service. If it is the plant, then is reproduction to be under present conditions or under those existing at the time of construction, and are present prices or some average prices to be used? If it is the service, is reproduction to be in light of physical conditions existing at the time of construction or modern conditions, with allowances in both cases for all developments in the art and technique of supplying the service?

In any case, value taken on the basis of prudent investment tends, in the long run, towards value on the basis of the cost of reproducing the service. Replacements made in the light of modern conditions are debited to the capital accounts at cost, which reflects market value, while retirements are credited at their original costs. It may be said, therefore, that some prudent investment standard should be adopted as a means of merely ironing out market fluctuations, but such a basis may be uneconomical and unwise from a regulatory point of view.

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[1] H. P. Gillette—"Two Conflicting Theories of 'Valuation' of Railways and Utilities"—*Engineering*, LII (Nov. 19, 1919), 580-582.

Prudent investment promises savings in the cost of appraisals, litigation, and reduction of certain risks, while cost of reproducing the service encourages the most economic use of the factors of production. As a practical problem that solution which will bring about the desired expansion in the industry at the lowest cost is the best. To attain this end it is necessary to analyze the advantages and disadvantages of the various valuation doctrines from an economic point of view in order to determine which principle best serves the social purpose.

114. Economic Evolution of Valuation Doctrine in Court Decisions *

> All that is beneficial in property arises from its use and the fruits of that use; and whatever deprives a person of them deprives him of all that is desirable or valuable in the title and possession. If the constitutional guaranty extends no further than to prevent a deprivation of title and possession, and allows a deprivation of use and the fruits of that use, it does not merit the encomiums it has received.

Thus, Mr. Justice Field stated an unchallenged economic principle in his dissenting opinion in Munn *v.* Illinois.[1] Time, however, has demonstrated the correctness of the views of the majority who, supported by common law precedent, said in the language of Mr. Chief Justice Waite:

> When one becomes a member of society, he necessarily parts with some rights or privileges which, as an individual not affected by his relations to others, he might retain. "A body politic," as aptly defined in the preamble of the Constitution of Massachusetts, "is a social com-

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* An interpretation with citations by L. D. Jennings, Research Assistant in the Institute for Research in Land Economics and Public Utilities, Northwestern University, Chicago. For a more complete discussion with extensive references, see E. C. Goddard—"The Evolution of the Cost of Reproduction as the Rate Base," *Harvard Law Review*, XLI (1928), 564-592.

[1] 94 U.S. 113 (1876)—Munn and Scott, who had been in business since 1862, had not taken out a license as required by a statute passed in 1871 under which the prosecution was brought, nor had they charged the rate set by it, nor given a bond. They were found guilty and fined $100—the decision being upheld by the Supreme Court of Illinois. Plaintiffs assigned error relying on Sects. 8 & 9, Art. 1, of the Fourteenth Amendment to the Federal Constitution.

> pact by which the whole people covenants with each citizen, and each citizen with the whole people, that all shall be governed by certain laws for the common good." This does not confer power upon the whole people to control rights which are purely and exclusively private;[2] but it does authorize the establishment of laws requiring each citizen to so conduct himself, and so use his own property, as not unnecessarily to injure another. . . . Under these powers the government regulates the conduct of its citizens one toward the other, and the manner in which each shall use his own property, when such regulations become necessary for the public good. . . . Property does become clothed with a public interest when used in such a manner as to make it of public consequence, and affect the community at large. When, therefore, one devotes his property to a use in which the public has an interest, he, in effect, grants to the public an interest in that use, and must submit to be controlled by the public for the common good, to the extent of the interest he has thus created.

It then remains only to ascertain whether the business under consideration comes within the operation of this principle.

Under the doctrine enunciated in Munn *v.* Illinois, there appeared to be only a vague limit to the states' power to regulate such industries and to deprive their property of value through control over rates and service. But it soon became evident that, unless certain checks were placed upon this power, mere title and possession would be a worthless right if not an absolute liability.

In Reagan *v.* Farmers' Loan and Trust Co.,[3] it was recognized that the power to regulate was not unlimited; that rates could not be reduced below a point sufficient to pay operating expenses and, in addition, some element of profit as compensation for the use of the property.

This opinion, indicating that there must be some return on the property used in serving the public, called attention to the more underlying elements involved in rate questions. For under this doctrine the more property used the greater would be the return necessary to prevent confiscation.

With returns dependent to some extent on the amount of property devoted to the public use it became necessary to adopt some standard by which the value of such property could be determined. If measured in terms of dollars actually or prudently invested, such value would vary only with additions to or subtractions from the property accounts. If measured according to the purchasing power of these dollars or the cost of constructing a new plant in light of modern developments, it would fluctuate with the variations in the purchasing power of money, or change with the improving technique and economic conditions affecting construction.

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[2] *Thorpe* v. *R. & B. Railroad Co.*, 27 Vt. 143.

[3] 154 U. S. 362 (1894).

Neglecting for the time being the question of technical improvements and changes in the economic conditions affecting construction [4] the effect of the price level on the valuation problem should be considered.[5]

Since 1865, the trend of the general price level had been downward. Most of the utilities, principally the railroads, had been constructed under pioneer conditions at high prices. Their officers and owners were interested in maintaining their dollars and securing returns to recoup the losses incident to the early developmental and frontier period. The representatives of the people, however, were interested in low rates and adopted the competitive doctrine—the cost of reproduction—as the best means of legally obtaining the desired results.

In 1896-1897, the price level reached its lowest point. The public had been struggling for thirty years with rapidly falling prices and monopoly abuses by the carriers. The people felt that their troubles were traceable to the growing trusts and monopolies; and the railroads, standing between the frontier and the market, bore the brunt of the attack. The producers desiring lower rates and possessing the political power endeavored to seize the opportunities offered by the price level and changing condition to accomplish their end.

Some of the early decisions handed down during this period by the State Courts upheld the contention of the people and decided as in Steenerson *v.* Great Northern Railway [6] that "the material question is not what the railroad cost originally, but what it would now cost to reproduce it."

Where rates were finally lowered by legislative action the carriers protested carrying their case to the Supreme Court of the United States where in Smyth *v.* Ames [7] the Court, after listening to some of the ablest testimony and counsel—including W. J. Bryan for the Public and cost of reproduction—handed down their famous valuation formula as follows:

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[4] These are risks of the business and must be compensated accordingly. Technical improvements introduce the problem of obsolescence while "going value" or the advantages of an early start usually tend to make up the competitive chance of loss due to changes in economic conditions affecting construction.

[5] See Chart 60 on Public Utility Regulation and the Price Level by Paul J. Raver, showing the index of commodity prices and its relation to the valuation problems, opposite page 531.

[6] 69 Minn. 353; 72 N. W. 713 (1897).

[7] 169 U.S. 466 (1898); "That the question was involved in *Smyth* v. *Ames* is apparent from a consideration of the facts. The Union Pacific railroad had been built just after the Civil War, when prices were high,

> We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public. And in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of the public highway than the services rendered by it are reasonably worth.

This statement, all inclusive as it was, doubtless brought considerable relief to the officers and stockholders of the utilities. Here was a formula so broad as to challenge their imagination and tax their ingenuity to gather material and present analyses showing that this, that, or something else constituted items of value which must be considered to prevent confiscation.

Almost coincident with Smyth *v.* Ames (1897), however, the price level started upward, and, before many years had passed,

across two thousand miles of unoccupied country. Stock jobbing and contract jobbing there had doubtless been, but in the very nature of the case the construction of the road had been enormously expensive. The State of Nebraska, which was now fighting to reduce rates, owed its prosperity and its very existence to the railroads that had been made possible by the money that had been adventured for the public; and now, at the very moment when the country had been developed to such a point that the railroads could hope for adequate returns on their investment, it came in and insisted that it could build those roads new for $20,000 per mile—including terminals, for $30,000 per mile—and it did not propose to pay returns on the Union Pacific burden of $103,000 per mile, as represented by the face value of stock and bonds outstanding. There was no showing of prudent investment, and no admission of any right to return upon it, if determined. The only reason a road could then be built at $20,000 per mile was because use could be made of these roads in which far more had necessarily been invested. This investment, said Mr. Justice Harlan in effect, must be considered in fixing rates, and to it, and not to cost reproduction, he gave first place in his list." Quoted from E. C. Goddard, "The Evolution of the Cost of Reproduction as the Rate Base," *Harvard Law Review*, XLI (1928), 565.

reached a point far above construction cost levels. This rise brought with it increased costs of operation, and the utility owners and operators found that under the old rate schedule their business was no longer profitable. Higher rates were necessary and in order to secure a readjustment in the rate schedules and larger returns for themselves they submitted not only the increase in operating expenses, but under the doctrine of Smyth *v.* Ames brought forward at the highest figure obtainable all elements of value which they could devise to increase the valuation placed on their property. The public lacking such talent engaged in its service, the motivating force of individual gain, and the necessary statistics or funds to compile same, was forced to reverse its position if not its aim and act more as a governor to keep the growing rate-base down as low as possible. Prudent investment, due to the lack of records, lost much of its force; able counsel supported by the more personal appeal exercised by the utilities caused a shift which tended to give more weight to considerations showing the greater value.

Since Smyth *v.* Ames, the trend of court decisions and the weight of authority has been in favor of the cost of reproduction—not of the service but of the existing plant—at present prices under conditions prevailing at the time of construction with (sometimes without) deduction for depreciation and some consideration of other elements of value. This, in spite of the fact that the Courts have iterated and reiterated that the cost of reproduction is not the sole element to be considered nor was any particular weight ever given to any of the standards of value set up by Smyth *v.* Ames.[8]

The unprecedented (as far as regulation was concerned) rise in the price level caused by conditions growing out of the World War (1915-1920) brought with it innumerable difficulties. The situation was so clearly abnormal that the Courts were hesitant regarding these greatly enhanced values. Cases decided during this period generally gave weight to 3-, 5-, or 10-year average prices, split inventory, and other similar devices to establish the figure upon which the utilities were to be allowed a fair return.[9]

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[8] For treatment of the various elements of value see *Knoxville* v. *Knoxville Water Co.*, 212 U.S. 1 (1909), and Minn. Rate Cases 230 U.S. 352 (1912).

[9] Following the fall in price level in 1920 a plateau was established 50 per cent greater than in 1913, 80 per cent higher than that prevailing when *Smyth* v. *Ames* was decided, and roughly 50 per cent below the average of 1916-20. Prices have tended to remain at this level for the past seven years, and indications are that the Federal Reserve Board through their control over the rediscount rate will tend to stabilize the dollar at this point.

Except for the recognized temporary nature of the war fluctuations, however, the trend towards cost of reproduction valuation never received serious question in judicial opinion until Mr. Justice Brandeis dissented on argument while concurring in the opinion in State *ex. rel.* Southwestern Bell Telephone Co. *v.* Public Service Commission.[10]

In this dissent Mr. Justice Brandeis objected to the formula enunciated in Smyth *v.* Ames as follows:

> The so-called rule of Smyth *v.* Ames is, in my opinion, legally and economically unsound. The thing devoted by the investor to the public use is not specific property, tangible and intangible, but capital embarked in the enterprise. Upon the capital so invested the Federal Constitution guarantees to the utility the opportunity to earn a fair return.[11] Thus, it sets the limit to the power of the state to regulate rates. The Constitution does not guarantee to the utility the opportunity to earn a return on the value of all items of property used by the utility, or of any of them. The several items of property constituting the utility, taken singly, and freed from the public use, may conceivably have an aggregate value greater than if the items are used in combination. The owner is at liberty, in the absence of controlling statutory provision, to withdraw his property from the public service; and, if he does so, may obtain for it exchange value. . . . But so long as the specific items of property are employed by the utility, their exchange value is not of legal significance.
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> The investor agrees, by embarking capital in a utility, that its charges to the public shall be reasonable. His company is the substitute for the state in the performance of the public service, thus becoming a public servant. The compensation which the Constitution guarantees an opportunity to earn is the reasonable cost of conducting the business. Cost includes not only operating expenses, but also capital charges. Capital charges cover the allowance, by way of interest, for the use of the capital, whatever the nature of the security issues therefor; the allowance for risk incurred; and enough more to attract capital. The reasonable rate to be prescribed by a commission may allow an efficiently managed utility much more. But a rate is constitutionally compensatory if it allows to the utility the opportunity to earn the cost of the service as thus defined. . . .
>
> The doubts and uncertainties incident to the Rate Base v. Rate of Return can be eliminated, or lessened, only by redefining the rate base, called value, and the measure of fairness in return, now applied under the rule of Smyth *v.* Ames. The experience of the twenty-five years since that case was decided has demonstrated that the rule there enunciated is delusive. In the attempt to apply it insuperable obstacles

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[10] 262 U.S. 276 (1923).

[11] Except that rates may, in no event, be prohibitive, exhorbitant, or unduly burdensome to the public.

have been encountered. It has failed to afford adequate protection either to capital or to the public. It leaves open the door to grave injustice. To give to capital embarked in public utilities the protection guaranteed by the Constitution, and to secure for the public reasonable rates, it is essential that the rate base be definite, stable, and readily ascertainable; and that the percentage to be earned on the rate base be measured by the cost, or charge, of the capital employed in the enterprise. It is consistent with the Federal Constitution for this court now to lay down a rule which will establish such a rate base and such a measure of the rate of return deemed fair. In my opinion, it should be so.

The rule of Smyth *v.* Ames sets the laborious and baffling task of finding the present value of the utility. It is impossible to find an exchange value for a utility, since utilities, unlike merchandise or land, are not commonly bought and sold in the market. Nor can the present value of the utility be determined by capitalizing its net earnings, since the earnings are determined, in a large measure, by the rate which the company will be permitted to charge; and thus, the vicious circle would be encountered. So, under the rule of Smyth *v.* Ames, it is usually sought to prove the present value of a utility by ascertaining what it actually cost to construct and install it; or by estimating what it should have cost; or by estimating what it would cost to reproduce or to replace it. To this end an enumeration is made of the component elements of the utility, tangible and intangible. Then the actual, or the proper, cost of producing or reproducing, each part, is sought. And finally, it is estimated how much less than the new each part, or the whole, is worth. That is, the depreciation is estimated. Obviously, each step in the process of estimating the cost of production or replacement involves forming an opinion, or exercising judgment, as distinguished from merely ascertaining facts. And this is true, also, of each step in the process of estimating how much less the existing plant is worth than if it were new. There is another potent reason why, under the rule of Smyth *v.* Ames, the room for difference in opinion as to present value of a utility is so wide. The rule does not measure the present value either by what the utility cost to produce, or by what it should have cost, or by what it would cost to reproduce or to replace it. Under that rule the tribunal is directed, in forming its judgment, to take into consideration all those, and also other, elements, called relevant facts.

Obviously, value cannot be a composite of all these elements. Nor can it be arrived at on all these bases. They are very different, and must, when applied in a particular case, lead to widely different results. The rule of Smyth *v.* Ames, as interpreted and applied, means merely that all must be considered. What, if any, weight shall be given to any one, must practically rest in the judicial discretion of the tribunal which makes the determination. Whether a desired result is reached may depend upon how any one of the many elements is treated. It is

> true that the decision is usually rested largely upon records of financial transactions, on statistics and calculations. But, as stated in Louisville *v.* Cumberland Co.,[12] every figure . . . that we have set down with delusive exactness is speculative.

The majority of the Court, however, subscribed to the doctrine that "there must be a fair return upon the reasonable value of the property at the time it is being used for the public . . . and, . . . if this property which legally enters into consideration of rates has increased in value since it was acquired, the company is entitled to the benefits of such increases."

A consideration in the minds of the commissioners of the cost of reproduction would no longer suffice, but actual allowances must appear in their findings. This was reiterated in Bluefield Waterworks and Improvement Co. *v.* Public Service,[13] but in Georgia Railway and Power Co. *v.* Railroad Commission[14] decided the same day, they held that "there was no rule that, in valuing the physical property, there must be slavish adherence to the cost of reproduction less depreciation," although in this case there had been no definite allowance for increased prices excepting $125,000—for appreciation in land values.

In spite of Mr. Justice Brandeis' dissent and other arguments to the contrary, the movement towards a cost of reproduction standard has continued. Each new case seemed to give force to the expression until in McCardle *v.* Indianapolis Water Co.,[15] the Supreme Court, seemed to subscribe to the doctrine without reservation. The Court brushed aside ten-year average prices and the fact that the commission claimed to have considered all of the factors and said:

> It is well established that values of utility properties fluctuate, and that the owners must bear the decline and are entitled to the increase, . . . if the tendency or trend of prices is not definitely upward or downward, and it does not appear probable that there will be a substantial change of prices, then the present value of lands plus the present cost of constructing the plant, less depreciation, if any, is a fair measure of the value of the physical elements of the property.

Mr. Justice Brandeis again dissented from what he termed this "Spot Cost" of reproduction doctrine saying,

> Nor do I find in the decisions of this court any support for the view that a peculiar sanction attaches to Spot reproduction cost as

[12] 225 U.S. 430, 436 (1912).

[13] 262 U.S. 679 (1923).

[14] 262 U.S. 625 (1923).

[15] 272 U.S. 400 (1926).

distinguished from the amount it would actually cost to reproduce the plant if that task were undertaken at the date of the hearing. Spot reproduction would be impossible of accomplishment without the aid of Aladdin's lamp. The actual cost may conceivably indicate its actual value at the time of completion or sometime thereafter. Estimates of cost may conceivably approximate what the cost of reproduction would be at a given time. But where a plant would require years for completion, the estimate would be necessarily delusive if it were based on Spot prices of labor, materials, and money. The estimates, to be in any way worthy of trust, must be based on a condition of varying costs of labor, materials, and money for a period at least as long as would be required to construct the plant and put it into operation.

The prevailing legal opinion regarding the case, however, seems to be that the Court has not cast off the other criteria of value, and if ever the price level or changing economic conditions again upset the industry they still will be able to pick up these threads without going through the throes of reversal. The basis for this conclusion is found in the fact that while the Court places the major emphasis on the cost of reproduction because of the relatively stable price level, they still give consideration to other factors which under different conditions would tend to influence their decisions.

Pending on the docket of the Supreme Court is still another case which in light of the importance attached to the valuation of the railroads by the Interstate Commerce Commission is of considerable interest. This case is known as the St. Louis & O'Fallon Railway Co. *v.* U. S.[16] and contests the valuation for the recapture of earnings under the Transportation Act of 1920. The Commission in valuing the carriers used the split inventory method—cost of reproduction as of 1914 plus recorded net cost of additions less retirements to date, with the exception of land where present values were used.

In preparing this case the Commissioners did their best to present their point of view on the valuation question. Arguing as practical men in close touch with the situation they favor the legitimate investment standard as the only solution in line with the best public policy.

With the position and arguments of the Commission definitely stated it seemed that this case would open the entire question and bring forth a more definite stand on the part of the Court. But the Statutory Court of three judges sidestepped the issue on the grounds that even on the valuation claimed by the carrier the net return to the Company, considering its share of the surplus earnings[17] above 5.75 per cent, would be about 8 per cent, and, therefore, not confiscatory.

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[16] 22F (2nd) 980 (1927). See also 124 I.C.C. 1 (1927).

Before concluding this consideration of the leading valuation cases attention should be called to the methods followed in Great Britain and since 1885 in Massachusetts. Here, instead of using the various valuation standards with the resulting expensive and elaborate investigation, bulky records, and time consuming activities, they adopt the more simple method of controlling the issuance of securities and the use of the funds so acquired, allowing a fair return on the basis of capitalization rather than physical values.

The returns thus based upon "Capital honestly and prudently invested, and devoted to the public service,"[18] seem to have brought about desirable results in these particular areas. In Massachusetts the Commission feels that under it the utilities have prospered and the public has had an efficient and economical service.[19]

To date, none of the utilities has had the courage to carry its cases through the federal courts, but Worcester Electric Light Co. *v.* Attwill[20] is now pending and promises to test in the Supreme Court of the United States whether or not custom has established precedent in Massachusetts sufficiently strong to justify special treatment.

Thus, the valuation question stands in the Courts. The future remains uncertain. Will the cost of reproduction doctrine continue or will the prudent investment theory recover its lost ground? If cost of reproduction prevails, will it be the cost of reproducing the service in light of modern developments, or the cost of reproducing the present plant under conditions prevailing now or at the time of construction at present, or some average price level? If prudent investment succeeds in attaining the throne, will it be prudent investment in terms of dollars prudently invested, capital (plant and equipment) properly dedicated to the public service, or purchasing power prudently sacrificed? Or will the formula of Smyth *v.* Ames with "value" consisting of every conceivable element continue, permitting able counsel armed with masses of evidence to battle while time's forward movement with changes in economic conditions discards their efforts as obsolete?

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[17] In the Dayton Goose Creek Case (263 U.S. 456) the Supreme Court held that in figuring the rate of return allowed the carrier its share of the excess earnings must be considered in addition to the base rate of return.

[18] *Customer* v. *Worcester Electric Light Co.*, P.U.R., 1927, 705C.

[19] See Goddard: *Supra*, p. 574.

[20] P.U.R. 1927, 796E.

116. Ethical and Economic Elements in Valuation *

In the valuation of public service properties there is as yet great confusion as to what is meant by the word *value,* or rather as to which of the many definitions of that very indefinite word shall be applied to the varying circumstances and purposes of valuation work.

In the pioneer cases involving valuation the courts have, as a rule, wisely refrained from being too definite in attaching exact meanings to the word value. But as the work proceeds and grows in importance it becomes desirable that we have a clearer conception of what interpretations of value should be used in arriving at just conclusions when assigning so-called value to the properties subject to public regulation.

The value of a public service property in the strict economic sense means a price which the property would bring under a given set of circumstances. It does not establish that price or value which the same property should bring in order to meet all the requirements of justice for both the sellers and buyers. In other words, there is a clear distinction between an economic value and what may be called an ethical value.

Still more distinct does ethical value appear from economic value when we consider the valuation of a property for the purpose of fixing a return or the making of rates. In this case there is no intention of exchange of property. The question is primarily one of ethics or justice between the owners of a public utility and the consumers of its product. And in the problem of public service valuation it is neither possible nor desirable to neglect the element of justice which should enter into the determination of the values involved. The exercise of the power in the public regulation of the utilities is a governmental function, and being so, the very first element to be considered is the element of justice.

The conclusions arrived at in valuation cases, while generally not unjust, have been, as a rule, the result of haphazard and conglomerate methods of reasoning. They rest upon no well understood or well-established principle or theory, so defining the value to be arrived at and so determining the elements entering into it as to furnish even an approximately correct guide to results satisfying the sense of justice of men responsible as Judges or Commissioners for the right solution of the problems presented to them.

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* J. E. Allison, "Ethical and Economic Elements in Public Service Valuation," *Quarterly Journal of Economics,* XXVII (November, 1912-August, 1913), 27-49.

The danger in the situation lies in the possibility of the rigid adoption by the courts or commissions of one of the several theories or rather methods of arriving at value which are now being presented to them. So long as none of these theories predominates and the courts and commissions continue to use the indefinite makeshift, of rendering opinions by stating that "we must consider" this element and that element; and so long as they continue to make exceptions in the application of any one of these theories to all points of the problem involved—so long they are in fact guided by a rough sense of justice and fitness, and the results may, as a rule, be tolerably satisfactory. But unless some guiding over-theory of ethical value is developed, it is to be feared that as time goes on one of the present existing theories of value will, by gathering gradually the strength of precedent, finally fix itself as the authority by which the value of public service properties shall be estimated. Already we can see evidence of one of the theories (Cost of Reproduction New) beginning to gain acceptance more rapidly than the others, and becoming intrenched as a precedent. Unfortunately, under close analysis this theory appears to be little suited to producing permanently satisfactory results.

In the following discussion and criticism of several theories of valuation the writer will use the names of the theories only with the meanings defined herein, and in the whole discussion he has primarily in mind valuation for rate making, or kindred purposes, as applicable to what may be called the Municipal Utilities,—Electric Light and Power, Gas, Water, Street-Railways, Telephones, and the like.

The methods in use for arriving at present value of the property of public service companies may be classified under three distinct theories, perhaps four, no one of which can be applied in its purity without showing points of injustice either to the companies or to the consumers. These theories are as follows:

First: The theory of Original Cost, which, briefly stated, is that the value upon which returns may be allowed shall be the actual cost of the property remaining in the service of the public (with or without a deduction for depreciation).[1]

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[1] Whether or not a property should be depreciated to determine the amount to be earned on in rate cases is a question. The problem of depreciation cannot be treated in this paper. The writer's views on the subject are given in a pamphlet recently published as a report to the St. Louis

Second: The Continuous Property theory, sometimes called the ''Antigo'' theory, which is really a sub-theory of Original Cost, and will be more precisely defined in a later part of this paper.

Third: The theory of the Cost of Reproduction New, which means that the company should be allowed to earn on a value (with or without a deduction for depreciation) represented by the estimated cost of reproducing, at the time of the valuation, the identical property then in the service of the public. That is, present prices to reproduce are to be applied to measure each item of value as it appears in either intangible or tangible property.

Fourth: The theory of Cost of Reduplicating the Service, which means that the value to be earned-on should be the present cost of installing a plant capable of performing the same service as the one under consideration, but not necessarily an identical plant.

In the present article it will be possible only to examine some of the salient points of each theory.

The first theory (Original Cost) does not contemplate, as many seem to think, the taking as a basis for valuation all the money which at any time or for any purpose has gone into the enterprise. It merely assumes that the basis of value shall be the actual cost of the items of equipment used and useful in the service at the time of the valuation. It also assumes that there shall be allowed, as so-called intangible items of value, such expenses incurred in organizing and establishing the business as can be shown to have been necessary, reasonable, or for the ultimate benefit of the public. And it may assume a deduction from cost to offset the depreciation which has taken place in the physical property.

The theory is an ethical one in the sense that it attempts to measure the efficient sacrifice which the investors have made in the service of the public. It is practical on its administrative side, in that it takes as a measure of value an actual exchange which has taken place, and uses the prices which prevailed in making that exchange. It is, in fact, an effort to reproduce the results which would show in property account today on a set of books which had been perfectly kept throughout the existence of the enterprise.

Public Service Commission, and entitled "Should Public Service Properties be Depreciated to Obtain Fair Value in Rate Cases?"

The theory of Original Cost also presents a number of advantages from the standpoint of safety to the investor. In the first place it offers stability; the investors who have placed say a million dollars in a public utility enterprise have some assurance (depreciation excepted) that they are to be allowed to continue to earn on a million dollars, provided the investment is made with good faith and reasonable judgment, and the property kept up. All risk of loss in value from fluctuations in the price of labor and material is removed. It is true that all chance of gain from the same fluctuations is also removed. But generally speaking capital, especially large capital, would much prefer safety to chance of gain at the expense of safety. If this is granted, it follows that the consumer also would benefit by the low return at which capital could be secured.

It is sometimes urged against the theory of Original Cost that it is often impossible in practice to obtain unit costs for the time of construction of the property under consideration. This may occasionally be true . . . but reliable data . . . can generally be obtained by the investigator who will take the trouble to go in detail to the bottom of the work he has in hand. It is certainly no more difficult than to estimate the present cost now of such equipment as is no longer on the market. . . .

The disadvantage of applying this theory of Original Cost in its purity appears at once, however, when we come to consider the item of real estate, or private right-of-way. . . . (Investors generally have expected such property to increase in value and have committed themselves on that basis. . . . And as universal custom has sanctioned the accrual of the so-called unearned increment it should be allowed at least as far as the past is concerned while the future policy depends on the declared policy of the regulating authorities.) [2] . . .

The second theory of valuation, as I have listed them, known as the "Continuous Property" or "Antigo" [3] theory, . . . attempts to measure accurately the ultimate cost to the investor of building a plant and establishing a business. It is essentially an accountant's rather than an engineer's method of valuation, and presupposes an accuracy and clearness of records which unfortunately are seldom to be met with in properties whose history extends back even a few years.

The theory is that from its beginning a company is entitled

[2] The author considers the objections to this proposition.

[3] From its recognition in *Hill* v. *Antigo Water Co.*, 3 Wis. R. R. Com. Reports, 623 (1909).

to earn and distribute in interest or dividends, a certain percentage upon its investment over and above all charges, including a proper amount for depreciation. If in any year it earns and distributes more than this allowed percentage, then the amount of this surplus is to be deducted from the value of the property. If in any year it earns and distributes less than this allowed percentage, then the deficit is to be capitalized.

While calculations based upon this theory may be valuable for obtaining certain data for measuring the cost of establishing a new business, yet, even assuming the correctness of the basic figures, the theory cannot justly be applied without very important modifications and limitations. The period during which a deficit may be allowed to be capitalized as cost of establishing a business must be limited to a reasonable time at the beginning of a new business. It must also be assumed that there was a reasonable demand for the utility when built, and that the property was well managed during the period of deficit.

It is evident that if such limitations to the theory are not considered, a utility might be established long before there could possibly be a demand to justify the investment, or might be built where ruinous competition was sure to take place, and that the results of such bad judgment, and of possibly long periods of bad management not easily detected might ultimately be placed as a perpetual burden upon the consumers. In short, the application of the Continuous Property theory in its purity and without limitation would amount to a guarantee of the investment by the public. In this case, all risk to the investors being in the end eliminated, the return allowable should logically be reduced to a figure somewhat approaching the ordinary return on municipal securities; too radical a step to be considered, for the present at least. . . .

(As a corrollary to this proposition a surplus above a reasonable return would act to reduce the value of the property. This, however, would not be allowed by the court.)

The theory is founded upon ethical elements, in that it attempts to see that the investor has a reasonable return, and only a reasonable return, upon his investment from the beginning, and it might be sound theoretically, provided the enterprise has been entered into in response to a distinct and officially expressed demand on the part of the community for the building of the utility. In other words, if the community had demanded it, the community might justly be called upon to bear any losses incurred. . . .

While the Continuous Property theory is founded upon ethical principles, the practical difficulties of applying it to properties already in existence and whose histories are at all complicated or whose accounts are obscure become so great as to make it very dangerous should it become established and used blindly as precedent.

The third theory, that of Cost of Reproduction New, is most often heard of in public service valuation. Yet when closely examined it appears the most illogical of the four. The values arrived at (before depreciating) do not represent theoretically what was paid for the different items of the property, nor when added up do they represent what anyone would give for the plant as a plant. It has been argued that Cost of Reproduction New represents in theory what a community would have to pay for a plant under condemnation proceedings. But this is not true, for the limit of the value of a plant to a purchaser, and the limit of its selling value to the owner is (leaving the established business and earning power out of consideration) what he can duplicate the service for, not what he can duplicate the identical plant for. It is seldom that a plant would be duplicated if it were to be replaced by another one, and this is especially true of large plants which are the result of the growth of years in business.

A case in which the exact application of the theory of Cost of Reproduction New would produce a clear violation of the principles of justice is where a company in its underground construction has placed its pipes or conduits in the streets at a time when these streets were unpaved or paved very cheaply. In replacing the streets to their original condition the company would make but a small investment. Now suppose that the city, after the work of the company is done, decides to put down a costly pavement. The community pays the cost, but under a strict construction of the theory of Cost of Reproduction New, the company would claim the right to earn on the value of the expensive pavement, with the result that the community not only would make the investment in paving but would actually pay the company a return on it, in the form of rates calculated upon the value determined under this theory.

On the other hand, a considerable item of value as presented in most valuation cases is that of Cost of Establishing the

Business, which is, in fact, an attempt to calculate the expense incurred in creating a demand for the product, or the deficit in just returns on the investment while awaiting the development of the business. Under the theory of Original Cost such an item might justly amount to a considerable sum. But it is evident that in many cases a duplication of the business under present conditions (as the theory of Cost of Reproduction New contemplates) would very materially reduce the amount allowable for creating demand or establishing business. Here the theory of Cost of Reproduction New might work considerable injustice against the company.

Injustice might also result in the case of a street-railway having been compelled by ordinance or circumstances to grade a street. It is plain that to lay the track to-day would not require such grading, and the investors would not be allowed return on money actually spent.

These are only three instances, taken from many which might arise in actual valuation work. They serve to illustrate clearly that the theory of Cost of Reproduction New neglects some of the ethical elements necessary to the adjudication of values by public officials. In fact, how can a theory of value be a just one when it is avowedly based entirely upon present conditions, and when it leaves out of account all the varied circumstances under which a set of investors may have placed their money in a public service? . . .

(Under this theory average prices are sometimes presented but this abandons the theory since if averages are taken why not use such prices over the whole period developing a theory of Average Price.)

The theory of Cost of Reproduction New has been presented to courts and commissions so frequently without there ever having been any effective analysis of its soundness, that it seems in a fair way to be generally adopted. If it should finally become, by force of precedent, a general rule in the valuation of public utilities, it is to be feared that the future investor may find that he has been led into a position where he can have no clear idea of the length of time during which he is to be allowed to earn on his actual investment. In case of a long period of low or declining prices, investments in such plants as gas and water works, where the property has a long wearing life, may take on an element of increased risk which will be disadvantageous both to the investor and to the consumer. The theory is staunchly defended in name by many who have had the opportunity to do actual work in public service valuation, especially among the representatives of the companies. But nearly every one of its defenders who knows anything about the real work will make so many sensible exceptions to the application of the pure theory, that it will become evident that what he is defending is not the Cost of Reproduction New theory at all. His method of working may be good and rational; he has simply applied the wrong name to it. But it must be borne in mind that the courts generally have not the opportunity to understand the full scope of the problem and the theories underlying it, and that mere words used in court decisions are powerful forces for the future. Those engineers and commissions who are using the term Cost of Reproduction New to define their work (which may be good) are raising the final establishment of a governing theory which they do not really intend to put forward. Taken for what its name means and in the sense in which court decisions may come to make it mandatory, the theory is lacking in ethical elements. It cannot be said to be good in logic or in economics.

The fourth theory of valuation, Cost of Duplicating the Service, is that which should be and naturally would be used by an engineer in advising a client contemplating the purchase of a given plant. It seems obvious that a plant, leaving the established business out of account, cannot be worth more to a purchaser than the sum for which he could erect an entirely modern plant of equal durability, efficiency, and capacity. Yet this theory is not used or given much weight either by the commissions or the courts in cases involving the valuation of public utilities. Its application, especially to rate-making, would be harsh and drastic and would leave out of account some of the essential elements of justice toward the man who has placed his money in the public service. . . .

An ethical value cannot be arrived at without considering the past. Taking present value in a strictly economic sense, neither the Original Cost of the plant nor the present Cost of Reproduction New would seem to be as logical as the theory of Cost to Reduplicate the Service. In public valuation work even if the theory of Cost to Reduplicate the Service were just, it would be impracticable on account of the impossibility of attaining agreement between engineers as to the specifications and cost of the hypothetical plant.

This review of the various theories of valuations shows that none of them can be applied in its purity without considerable violation of ethical principles or without encountering insurmountable practical difficulties. A study of all four of them shows, however, that Original Cost, as herein defined and perhaps modified in respect to real estate, presents many advantages over the others, both as to ethical results and as to ease of application. It has in addition the very great practical advantage of being the only theory which lends itself readily to the necessary plan of keeping valuations of public service properties always up-to-date by proper accounting. It should be the aim of every Public Service Commission to have finally on its records, for the instant use of the law-making or taxing arms of the government, a valuation brought down to the date of its use. After a complete detailed inventory and appraisal is made, the only practical method of keeping the valuation up-to-date is by adding the cost of each new purchase of property and deducting the cost of those items which are discarded, together with proper treatment of the depreciation account. It is evident that if any other theory than Original Cost is used in making the original appraisal by inventory, we will have in the end a valuation which is an irrational conglomeration of theories without ethical reasons for such conglomeration. The only other alternative would be a complete new appraisal every time the value of a plant is to be ascertained.

The trouble with the theory of Original Cost is that it does not satisfy the idea of attaining present economic value. On the other hand, the theory of Cost of Reproduction New, while superficially or rather in mere name it satisfied the idea of present economic value, does not in reality come any closer to present values than Original Cost. As applied in its strictest sense it would result, as stated before, in the mere summing up of the present cost of the various items and might be far from the value of the plant as a whole. As applied by taking five- or ten-years' average prices it may be as far from using present prices on the separate items as would be the theory of Original Cost.

The statement that the "trouble" with Original Cost is that it does not satisfy the "idea" of present value, means only that there exists a generally adopted but essentially superficial idea that we should try to get present economic value in a governmental valuation for rate making. Yet this assumption that the aim in rate cases is to attain present economic value is entirely superficial and erroneous, as becomes apparent at the first steps in the analysis of the work of any competent commission or court. The recognition of any circumstances of especial difficulty or especial advantage in the history of the creation of any particular property shows clearly that the real result of good work is to establish a Just Amount upon which the companies should be allowed to make returns, and not to establish a present economic value which would ignore the sacrifices of the creators of the enterprise so far as those sacrifices have been made in good faith and with benefit for the public. After all, the future is the field of effect of most valuation work, and even if a correct present value should be determined, can it be said, that this value would be more just in the future, or is more just now, than a value made up on an original cost to the investor of the plant and organization which is kept in the service of the public? . . .

At present we are going through a period of readjustment of values on account of the presence or imminence of public valuation, and this period necessarily brings much uncertainty as to investments in public service properties. Yet the true aim of regulation is to bring about eventually a condition where, so far as is possible, all risk and all speculation will be removed from the enterprise, and there will be a clear, lasting, and dependable understanding between the consuming public and the investing public. Such a desirable condition can be attained only by making it understood that investors are to be allowed returns upon what they properly invest and keep invested in the service of the public, and not by making their property the subject of future fluctuation in prices of labor and materials over which they can exert no control.

It is evident if the opinion of the Supreme Court in Willcox *v.* Consolidated Gas Company [4] is strictly adhered to, it could be claimed that there must be an entire revision of all prices entering into a valuation each time a rate is changed, and the opportunity is offered for any pedantic judge in a lower court to throw out any rate work even of the ablest commission, on the ground that present prices have not been used throughout. To use present prices throughout is impossible, where, as is often the case, work of the character under consideration is no longer done. In fact, it is practically impossible, in making up a detailed appraisal of any large property, to adhere strictly throughout either to present cost prices or to original prices. Yet this condition applies as a rule only to matters of minor importance,

[4] 212 U.S. 19. 1908.

while the adoption of a correct theory to be followed as closely as possible will often be of great importance in admitting or rejecting items of large value, especially where the so-called intangible assets are concerned.

When it is understood that to attain a true present economic value of a property is next to an impossibility, then it is at least to be hoped that, for the sake of stability in values, elimination of risks, and the establishment of clear understanding as to the future treatment of properties under governmental valuation, all parties, including the companies themselves, may accept some controlling theory which will subordinate the idea of economic value to the higher principle of ethical value and to the very valuable "commodity" of knowing what to expect.

It is obvious that ethical value and economic value are not necessarily the same thing. But there is a distinct and to a certain extent a logical point of view from which it is assumed that the economic value of a public utility property is its value once for all, and that in the making of a valuation the owners of these properties should not be placed upon any other plane than the owners of any other properties. It would follow from this that the present value of a public service property can only be the price at which that property would sell for today. But immediately the principle of public regulation of rates is recognized, it is evident that this regulation will affect and even control the economic value of the property; and if an ethical element based upon the sacrifices of the investor is not introduced, the public could, theoretically at least, make the rate anything it wished, and the value of the property would then be anything it wished, without regard to results which would be grossly and patently unjust.

The analysis submitted in this paper indicates that the theory of Original Cost gives the nearest approach to just results. And it appears in fact that in consideration of questions of justice we are generally forced back to what actually did happen in the production of any property; this means Original Cost. Yet this, too, cannot in many cases be applied rigidly; and should it become obligatory by court decisions, might prove only less hampering and harmful than the other theories.

The need is for some guiding over-theory which will guard against ethical errors and show where the different economic elements can safely be used or rejected. The courts and the commissions seem at present to be giving due weight to the ethical elements involved in the valuation cases presented, and it is possible that the better equipped commissions, if left to themselves, would continue to do so. From the nature of its work a good commission is a specialist in valuation, and should know all sides of its business. A court, from the varied character of the work required of it, is at best but an amateur in a specialized field and there is danger at any time that a judge in some high court, in a well intended effort to be somewhat specific in his definition of value, may fix upon us limitations which will materially hamper efforts to attain results just both to the companies and to the public.

In searching for a guiding ethical over-theory of value for use in making valuations of existing properties, there presents itself for consideration an adaptation of the socialistic theory of value, value measured by the sacrifice of the producers. The pure socialistic theory goes back to the sacrifice in the way of discomfort and physical effort made by the workman, and is, of course, entirely subversive of economic values as at present established. But it seems quite possible that an adaptation of the theory, which would only go back to the money sacrifice of the investor, might be found a workable theory for our problems of valuation and rate making. It would, however, be necessary to limit the theory to a consideration only of the efficient sacrifice made in the service of the public. Without the limiting word ''efficient'' the theory would run wild and admit of all kinds of abuse.

It may be objected that results based upon Efficient Sacrifice may not be a ''value.'' The term value is an unfortunate one when used in naming the ultimate object of Public Service Valuation work; only if qualified as Ethical Value does it express with any accuracy the result which should be desired. It would be much better if the object of so-called valuation were described as the ''Just Amount'' to be earned on, or the ''Just Capital.'' But it is probable that the idea of value is too intimately connected with the work for the use of the term ever to be eliminated.

The statement that the returns to be earned by the public utility companies should be so adjusted as to give a just reward for Efficient Sacrifice in the service of the public, is probably nothing more than the crystallization into a phrase of what has been the aim of the courts and commissions which have had the elements of justice in their minds when dealing with questions of valuation and rate making. Nevertheless, the statement in succinct form, if adopted as the definition of an over-theory, might serve to make questions of strictly economic value subordinate to the ethical questions of justice, and might possibly prevent many errors which are sure to occur in case any strictly economic theory becomes controlling.

117. Fair Value for Rate Purposes *

. . . Investors in putting their money into public utility enterprises are entitled to know whether, in case the utility is appropriately located and normally successful, it will be permitted to earn a return on the actual and necessary investment, or upon the cost of reproduction, or upon the market or exchange value of the property, or upon a combination of these or other factors. Any arrangement might conceivably be fair to the company and fair to the public provided it were known in advance, so that reciprocal relations between risks involved and returns secured might be established, and proper methods of accounting for depreciation and appreciation instituted. For the future, at least, it is clearly essential that some one standard should be adopted as the normal and controlling standard in determining fair value. As to the past, the situation, while more complicated, still points to the desirability of definitely choosing some standard. . . .

There is no reason why in the case of a virtual monopoly the public should be required to pay more than the normal cost of production; and sound reason why, in the long run, the public cannot pay less. Normal cost of production is the amount which in the long run it is necessary to pay to secure the utilities demanded by the public. It is the amount that will secure an equilibrium between demand and supply. . . .

Normal capital cost as applied to a new enterprise is a comparatively simple concept. But what is it as applied to a long established enterprise—to a water-supply plant, a gas plant, or a railroad system? Is it normal cost at the time originally installed or last renewed; or, on the other hand, is it the present cost of reproduction? Is it the actual cost or reproduction cost? We start with the premise that the reasonable rate of charge is to be determined by the fair cost of production. The point at issue between actual cost and reproduction cost is really whether by cost of production we mean cost at a particular moment or cost averaged over a period of years. In favor of present-moment cost it is asserted that what the public is entitled to is service at the rate of charge sufficient only to pay a fair return, under present investment conditions, upon the capital cost that would

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* Excerpts from an article by Robert H. Whitten, *Harvard Law Review*, XXVII (March, 1914), 419-436.

be required at present to furnish this service; and, conversely, what the company is entitled to receive is a fair return, under present investment conditions, on the capital cost that it or another company would have to expend at present in order to provide the service. A rate of charge measured on this basis is said to correspond to the present economic cost of the service.

The fallacy in this argument is due to a failure to realize the effect on cost determination of a fixed investment of capital. If a public service could be supplied without a fixed investment it would be true that cost of production could be determined without reference to the past. But these utilities cannot be supplied without a large capital outlay that cannot be withdrawn at will and upon which a certain risk has been assumed in anticipation of an assumed probable return. As the utility can be supplied only in this way, the actual cost of production cannot be determined without reference to these actual conditions. Cost of production determined by the reproduction method is largely hypothetical. It is not based on the actual conditions that limit the production of the utility.

Take the railroad industry. . . . The reproduction cost theory as applied to such an institution is particularly fanciful. How can real cost of transportation be held to change from year to year with the changing reproduction cost of the railroad right-of-way and terminals? . . . The real cost of transportation can only be determined by recognizing the only process by which transportation service can be supplied, that is, by devoting capital permanently to the enterprise.

The determination of a normal capital cost is one step in the process of determining a normal price, and this normal price is the amount which in the long run it is necessary to pay to secure the utilities demanded by the public. It is the amount which constitutes an adequate inducement for investment. Starting with the necessary investment as a base, the investor will estimate all the risks and hazards of the business, of every kind and nature, and against this will place all the possible chances of profit. The possible rate of return adequate to induce investment is naturally and necessarily a percentage on the actual cost. . . .

Assume, for example, that a possible annual return of 7 per cent on the actual outlay is reasonable and necessary to secure the establishment of a given public utility. If, however, the annual return is to be based not on actual outlay but on estimated reproduction cost in each year, 7 per cent will be more or less than a reasonable return in proportion as the chances favor an increase or a decrease in reproduction cost. If costs of land, labor, and materials are advancing, and all indications point to a continuance of such increase, a return of 7 per cent on such increasing cost is more than is reasonable and necessary to secure the establishment of the given enterprise. If on the other hand, all indications point to a continuous fall in the cost of land, labor, and materials, the prospect of a return of 7 per cent on such decreasing cost would not be adequate to secure the establishment of the enterprise. To furnish an adequate inducement, either the probable rate of return would have to be increased, or the cost of reproduction standard of determining capital cost would have to be abandoned.

The fair rate of return could be altered so as in a measure to offset the appreciation or depreciation of the base to which such rate of capital is applied. With declining prices the risk of depreciation in reproduction cost would be offset by an increase in the rate of return, and with advancing prices the probability of appreciation would be offset by a decrease in the rate of return. This, however, is but a poor method of accomplishing what can be more fairly and logically effected by directly basing the rate of return on actual capital cost. Any method that is permanently fair to both parties must get back to actual capital cost as the base for actual as distinct from nominal profits. . . .

The normal actual capital cost as a basis for rate determination, moreover, has a distinct advantage from the standpoint of public policy. It is desirable that rate schedules should have stability and should not fluctuate with the price of iron pipe or copper wire or with real-estate activity or reactions. A utility is not established for the purpose of speculating in copper wire or iron pipe or land. It must, however, in furnishing its service invest its money permanently in these things. The utility should not be expected to assume the risks of fluctuations in the price of the land and materials it uses. . . .

The public utility renders a continuous service and in doing so requires a permanent fixed capital. Both the plant and the business are a gradual growth. This essential continuity of growth and service is the fact that seems to be lost sight of in present-moment reproduction methods of determining cost of production. . . . Investment, depreciation, operating costs, risk, all are bound up in the past growth and development of the existing utility.

As justifying the reproduction method it may be argued that the public is always entitled . . . to secure service at a rate of charge sufficient only to cover cost of operation, interest, and profits of a substitute plant of the most modern approved design, capable of performing the same service as the existing plant. The company assumes the risk and enjoys the profit, if any, incident to this arrangement. This method involves a reproduction of the service rather than a reproduction of the plant. . . .

As thus stated, the reproduction method has so many difficulties that it is practically never employed. The reproduction of the service involves not only the determination of the cost of the most efficient substitute plant, but the determination of the present cost of reproducing the business, the proper allowance under present conditions for interest and profit, and the operating costs for the substitute plant. In most cases it is exceedingly difficult and expensive to determine the design of an equally efficient substitute plant. . . .

The cost of reproduction in practice, therefore, has come to mean the cost of a substantially identical reproduction of the existing plant. This is the usual method. It involves, however, a partial abandonment of the reproduction of the service theory, and a somewhat imperfect recognition of the fact that cost of production is necessarily related to the past as well as to the present and future. It constitutes an imperfect recognition of the necessary continuity in the life of the plant and its service.

By a further modification of the cost of reproduction method, cost of reproduction is made to mean not the cost at present prices of land, labor, and materials of reproducing a substantially identical plant under *present conditions,* but the cost at present prices of land, labor, and materials of reproducing a substantially identical plant under the *actual conditions* under which the existing plant was originally constructed. Under this method expenditures actually incurred in the development of the present property are fully allowed for, even though they would not be met with in the reproduction of an identical substitute plant. On the other hand, certain expenditures that have not been incurred in the development of the existing property, but would be incurred in the reproduction of the existing property, are included. The following is a statement of expenditures that would be included under this interpretation of the reproduction method. "If trees were cleared, then he (the appraiser) must allow for the cost of clearing, although not a tree may now be standing. If streets were graded, then the grading must be estimated, though today the entire city is as level as a floor. If quicksand was encountered in laying a pipe-line, then the added cost of excavating it must be allowed, even though subsequent works have drained the line so that it no longer has a yard of quicksand. If money was spent to educate the public to the use of the commodity sold by the corporation, then that money is a development expense which must be allowed, even though the expense would not now be incurred by a new corporation of like character."[1] Pavement over mains laid at the expense of the city, on the other hand, is an example of a reproduction cost that would not be included under the modified rule above mentioned.

The consideration under the reproduction method of piecemeal construction depends upon whether the modified view of cost of reproduction above referred to is adopted. Under a strict application of the reproduction method there would be no occasion for the application of piecemeal methods. The entire property would be reconstructed by the quickest and most economical method. The actual cost of constructing gas mains has doubtless increased where from time to time additional mains have been laid in the same street to meet increased demands. In the laying of telephone conduits and cables by the piecemeal method additional cost is incurred. On the other hand, certain overhead charges, such as organization, engineering, and interest during construction, may be lower where the property is constructed by the piecemeal process. Various authorities in using the reproduction method have considered it proper to allow for piecemeal construction. To this extent they have abandoned the strict reproduction method.

A strict application of the reproduction method means that interest and profits shall be determined by present conditions. . . . This theory disregards entirely the risk assumed when the existing enterprise was started and when the successive additions to investment were made. Most authorities recognize, however, that a fair return on investment cannot be determined in this way. Consideration must necessarily be given to initial risks and past earnings.

The reproduction method does not fit in with depreciation and accounting methods. The annual allowance for depreciation under approved accounting methods is not the amount required to replace the existing unit, but the amount required to write off the cost of the existing unit when it is necessary to replace it. Under approved methods the actual cost of a car when replaced is deducted from the capital account, and the cost of the new car is added to the capital account. An allowance for depreciation estimated on reproduction cost is consequently inaccurate in proportion as the reproduction cost differs from the actual cost. As long as the science of accounts is predicated on actual cost it is inconsistent and confusing in any proceeding to determine cost of production, to base either the accrued depreciation or the annual allowance for depreciation, on reproduction rather than actual cost. . . .

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[1] Discussion by Halbert P. Gillette in *Transactions of American Society of Civil Engineers*, LXXIII (1911), 382.

If public service industries were not already long established and our problem was that of devising a general policy that would serve as an adequate but not excessive inducement to obtain the establishment of the desired services, it seems clear that the actual and necessary outlay would naturally be taken as the normal capital cost upon which a fair rate of return would be allowed. The future cost of production of the service in a particular community would therefore depend somewhat on the prices of land, labor, and materials prevailing at the time the particular plant was established or last renewed. This seems natural and fair. The normal price of a virtual monopoly is necessarily something of an average. It cannot be determined wholly without reference either to past or future. The normal price is not the present moment hypothetical cost of production, assuming a reproduction at the present moment of the existing plant. Utilities requiring a large fixed investment cannot be permanently carried on on this basis, with justice to the investor and economy to the public.

But our public service industries have for the most part been long established. A vested right to increments, especially in land values, is claimed. In the past, theories of public control have been but vaguely formulated and very imperfectly applied. Consequently many believe that the cost of reproduction method of determining capital cost or fair value is essential as a starting point, but for the future, fluctuations in the price of land, labor and materials should result neither in an unearned increment nor an unmerited loss to the investor. . . .

If it were generally true that public utility properties could now be reproduced at less than actual cost the argument for the acceptance of actual cost as a normal standard for fair value would appeal very strongly to the public utility interests. As, however, prices of land, labor, and material have in general advanced enormously since 1896, most utility enterprises can only be reproduced today at a cost considerably in excess of the actual necessary cost. It is natural, therefore, that public utility interests should incline strongly toward the reproduction method.

It may be argued that it has, at least for a considerable number of years, been recognized by the highest courts that the company is entitled to earn a fair return on the fair value of its property. The courts have used the terms ''value,'' ''present value,'' ''fair value,'' ''reasonable value,'' and ''just value'' in relation to the amount upon which the fair rate of return should be based. That they have not usually had current exchange value in mind is clearly apparent from the fact that the chief weight in determining value has been given to cost, either actual cost or reproduction cost. They have usually used ''value'' in the sense of ''normal value,'' as that term is understood by economists, *i.e.* a value corresponding to the cost of production. It seems at first thought that reproduction cost corresponds more nearly to any proper use of the term ''value'' than does actual cost. It does have a closer relation to exchange value, but not necessarily a closer relation to exchange of production, which is the only sense in which the term ''value'' can be properly used in this connection.

It may be argued, nevertheless, that constant use of the term ''value'' in this connection has, whether rightly or not, produced the impression in the minds of investors and others that utilities would be allowed to earn upon a value represented by their reproduction cost. This argument seems particularly forceful in regard to land. It is argued that as the company owns land and could, if it so desired, dispose of it and pocket the proceeds, it amounts to confiscation not to permit it to earn on the present market value of the land. This statement needs qualification. In the first place, most land that is used for public utility purposes is improved to such an extent that if sold for other uses the loss due to the scrapping of the improvements would offset the increase of selling price over cost price. If a railroad right-of-way were sold for farm purposes, the loss due to the scrapping of the roadbed would more than offset any increment in the selling price of the land. In case the company desired to go out of business it could, of course, sell its entire property to any purchaser, but such purchaser would necessarily base his purchase price on probable earnings under the existing scheme of regulation. If, however, the company decided to abandon its franchise, scrap its plant, and sell its land for what it would bring for other uses, it could of course realize on the increment in the value of the land, but such increment would be far from sufficient to offset the loss in the value of the plant and equipment as based on actual cost.

But the determination of fair value is only one step in the process of determining a reasonable rate of charge. We have already found that a reasonable rate of charge for an appropriate and normally successful utility enterprise is the equivalent of the normal cost of production. The normal cost of production is the amount which in the long run it is necessary to pay to secure the utilities demanded by the public. It is the amount that will secure an equilibrium between demand and supply. Increments and profits of every kind enjoyed by the company must necessarily be considered a part of the total compensation that the company receives from the public. In so far as there are increments and profits arising from increase in land values, it is clear that such increments and profits should in a rate proceeding be considered either as income or as an offset in fixing the rate of return. Any apparent advantage secured by the company under the reproduction method is in a measure counterbalanced. The reproduction method as thus applied is therefore a roundabout method of accomplishing what can be more simply and effectively accomplished by basing the rate of return on the actual capital cost. This does away with the necessity of accounting for appreciation or reducing the nominal rate of return.

Most of the objections to the adoption of any standard of value arise from a consideration of the numerous difficulties and complexities created by the case of poorly located and unsuccessful enterprises. It is apparent that in such cases rates must be fixed without much regard to cost of production. Rates in such cases must be largely based on a fair judgment of the value of the service to the consumer. In such cases the existing property has little or nothing to do with the estimate. The entire problem is approached from the standpoint of what is fair to the consumer. It is recognized that a rate which would fairly compensate the company from the standpoint of its outlay is improper, as such rate would be higher than the consumer could justly be called upon to pay. Such cases are not, properly speaking, cases for valuation at all. They are cases in which the rates must be determined largely without regard to what is normally meant by value for rate purposes. It is true that no standard of rate-making can be adopted for such cases. The usual procedure is to determine actual cost, reproduction cost, accrued depreciation, capitalization, and perhaps other factors, and then to fix an amount as fair value which at the rate of return determined upon will permit of the rate which seems to correspond to the fair value of the service. The reasoning here is somewhat circular. The fair rate of charge must be first determined and then a fair value and fair rate of return that will seem to justify the rate of charge already determined upon. In considering a normal standard of fair value for rate purposes the abnormal case of the poorly located, unsuccessful, or partially obsolete enterprise should be excluded. Such abnormal enterprises must necessarily be put in a class by themselves in considering rate and valuation problems. If the discussion is limited to the normally located and successful enterprise it is clear that a controlling standard for the determination of fair value can and should be developed. It is essential that the relations between the company and the public be put on a more permanent and dependable basis. In justice both to the company and to the public the determination of this important matter should not be left wholly to the judgment or predilection of the court in each particular case. Most judges and individuals as well, whether consciously or not, use some standard as actually controlling. They may test their judgment of reproduction cost by actual cost, or they may test their judgment as to normal actual cost by reproduction cost, but in either event it is one or the other of these standards that is actually controlling.

The determination of a standard of value applicable to existing investments will be worked out if at all by the slow and piecemeal process of court decision in numerous cases. The final answer can only be given by the Supreme Court of the United States.

118. Railroad Valuation and Rate Regulation *

Valuation and the Price Level. Just when it began to seem that commissions and courts were more and more coming to place emphasis on cost of duplication (or, better, on the present cost of construction of a plant capable of rendering the desired service), a number of economists have begun to insist on original investment or original cost as the only proper basis for the regulation of rates.

The first criticism which naturally suggests itself is that to base rates on original money cost, without any qualification, makes both the public and the investors in railroad securities, speculators in the value of money and possible victims of chance. Suppose, for example, that the price level should fall, within a short period, by one-half. Then, if the railroads were allowed rates to make the usual percentage on the original cost, the public which patronized the railroads would have to pay rates much higher than would suffice to yield the current rate of return on newly constructed plants. These rates, therefore, would not be lower in the proportion in which prices generally were lower. Persons who had invested in other industries would find their returns cut in half, although these returns would be as high a percentage of the likewise-halved cost of plant reproduction. These lowered returns, however, would buy as much at the reduced price level as the higher returns had previously bought, so that there would be, for the investors in the industries as a class, no real loss. But it is proposed that the investors in public-service industries shall occupy a protected position. When all other prices fall by one-half, the rates of such industries and, therefore, the rates of railroads shall be regulated so as to fall by a much less amount and so as to leave for investors in railroads returns as high as before and returns which, at the reduced price level, will purchase twice as much as before.

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* Excerpts from an article by Harry Gunnison Brown, *Journal of Political Economy*, XXXIII (October, 1925), 505-530.

What, now, if most of the capital of a railroad (or any other public-service industry) has been supplied by a bond issue? The owners of the bonds are legally entitled to a fixed return, if the business earns it, regardless of changes in the price level. Even if prices should fall to a tenth of their former level, or lower, the amount due yearly to the bondholders would remain unchanged. Therefore, it may be said (and, in effect, it has been said), the rates of railroads ‘‘must’’ be allowed to stay higher than other prices, for even if it is allowable for the stockholders to be wiped out, the bondholders ‘‘must not’’ lose. And it may be further contended, since any loss would fall first and most severely on the stockholders, that no loss ought to be allowed.

But there are a number of important considerations on the other side. In the first place, so far as the bondholders are concerned, a reduction of their returns by one-half when the price level has fallen one-half involves no real loss. It is only a nominal loss. This remains true even if the principal of the debt, as well as the interest, is halved. And to prevent such a nominal loss is to give these bondholders, in effect, a real gain as compared with and at the expense of the rest of the community.

In the second place, although it is true that the stockholders are guarantors of the bondholders and may lose heavily if and when rates fall, nevertheless it is not unreasonable to presume that they took the risk of loss along with the chance of exceptional gain. Why should either the bondholders or the stockholders of a railroad (or other public-service industry) be even indirectly and partially, through a policy of rate regulation, guaranteed a fixed money income regardless of what happens to the general price level, when investors in competitive industries have to take their chances?

If, on the other hand, the price level rises, say by 100 per cent, then a doubled transportation rate, which will yield twice as many dollars on the investment, is no harder for the public to pay and yields no more, in terms of goods, to investors. Twice as many dollars is the same percentage as before of the reproduction cost, since the reproduction cost has doubled. If the contract between the stockholders and bondholders calls for a fixed return in dollars to the latter, they will, in effect, lose and the stockholders will gain, but the investors as a whole will neither lose nor gain. And surely it is to be doubted whether a practical public policy can base the rates of railroads on the relation of stockholders' to bondholders' contributions toward the construction of railroad plants.[1]

But let us leave aside considerations of justice, as such, and turn our attention for a while to possible effects of the policy of valuation and rate-making on industry. Suppose that the policy is adopted of fixing rates on the basis of original cost, and suppose that the general price level has fallen so that the plant could now be constructed for a fraction of this original cost. Then to keep the rates high enough to yield a reasonable return on this cost is to keep them so high as to discourage commerce which is worth while, which yields a benefit to the community in excess of what would be its present cost to the community, and which ought, in any ordinary economic reckoning, to be allowed to take place.

It is, indeed, often contended, and rightly, that increased traffic can be taken advantageously at less than average rates if the extra or additional cost incurred thereby is more than covered. Thus, a lower rate may be charged on coal than on brick, though cost of carriage be the same, if only thus can the coal (as extra traffic) be carried. But here a further issue is raised, viz., that of reducing rates on both brick and coal, when reductions will increase traffic, though not enough to make the lower rates as profitable as the higher, but when these reduced rates are high enough to yield a reasonable rate of return on what it would now cost to construct the plant. Under such conditions, to refrain from reducing rates operates to prevent commerce which is economically desirable and which, from the viewpoint of the general welfare, should not be prevented.

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[1] In view of possible changes in the price level, the fact that railroads have been financed so largely through bond issues is unfortunate. Sinking funds to retire bonds and the financing of new roads and extensions through issues of stock should perhaps be encouraged. But, after all, the one really effective way to get rid of the evils of a fluctuating price level is to stabilize the price level.

On the other hand, if prices greatly rise and rates are based on the number of dollars of original investment in a low-price period, then traffic is encouraged to take place which would not have been encouraged had prices remained stable. Thus a change in the general price level is made to change the relations of other industries to the railroad industry. Unless this would have been desirable had the price level not changed, why should it be desirable when the price level does change?

But it may be contended by someone that these low rates, if they cover the "particular operating costs" or "prime costs" of the business, are advantageous by virtue of encouraging traffic that is worth as much to the community as these costs. But if, the price level having greatly risen, railroad rates should be kept from rising proportionately, in order that traffic may be encouraged; then, had the price level not risen, these rates should be lowered far below the level at which they would yield reasonable returns on investment, in order to encourage traffic. It is very much to be doubted whether such rate regulation would be good public policy. It certainly would be hardly consistent with the policy of dependence, for such public-service industries as railroads, on private capital.

At any rate, looking at the matter from a long-run point of view, there is an obvious objection to having railroad rates lower than will yield a reasonable return on present cost of construction, especially if the discrepancy is marked. For such low rates may easily encourage more traffic than existing facilities can care for. But under such circumstances the construction of a new plant (or, perhaps, even new trackage) to care for the surplus traffic at these low rates would not be undertaken. And since the increased traffic may exceed the capacity of the old plant, congestion and the principle of "first come, first served" may bring it about that traffic which is not worth enough to justify paying high rates will displace traffic which is worth more to the community.[2]

But why not, it may be urged, construct a new railroad (or new trackage on the same railroad) which should carry the overflow freight at rates paying a reasonable percentage on the present cost of construction, while part of the freight is carried on the old railroad at much lower rates? Here again, however, difficulties arise. Which freight and whose freight shall be carried at the low rates when all cannot be? Do we not, in our fear that we may permit a railroad to make a return based on the present cost of constructing the necessary plant instead of the old and (in terms of the then dearer money) lower cost—do we not arbitrarily confer a favor, in the form of lower rates and, therefore, larger profits, on some shippers, or arbitrarily give preference to selected goods and so to the shippers or consumers of such goods or to both? And in case an old community has a railroad, not yet congested, with rates based on present (or relatively recent) cost, will not there be likely to result an economically undesirable distribution of industry and population?

Valuation and Changing Prices of Materials for Construction. Let us suppose now, however, that what has changed is not the general average of prices or price level, but the prices of steel rails, ties, engines, cars, etc., *i.e.* the things which go into the construction of railway plant. It will still be true that the best basis for regulation is the present cost of constructing a plant capable of rendering the desired service rather than the actual past cost of construction of the existing plant.

Let us assume, first, that the cost of construction of the necessary plant is now much less than was the original cost. Then to base rates on original cost, so as to make them yield the current rate of return on such cost, is to make them higher than they would be if based on present cost of construction.[3] Although such higher rates might be more profitable than lower rates would be, they would almost certainly cause a decrease of traffic.[4] This potential but prevented traffic would be, in part, traffic worth more to the community than it would cost, under present conditions, to carry it, including interest on the present construction cost of the necessary plant. Therefore, a geographical specialization which would be beneficial to the community is interfered with. The community, through having a railroad built some time ago, may be prevented from enjoying as much geographical division of labor as it could enjoy were it to depend upon a new railroad to be built under present cost conditions.[5] Economic loss is decreed when such a policy is insisted upon.

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[2] To those who may suggest that goods which can pay little may be socially better worth carrying than goods which can pay much, *e.g.* that coal might well be carried at low rates to benefit the poor, the answer is to be made that if wealth is not properly distributed, then the cause of this evil should be dealt with directly, rather than that the burden of correcting such evil should be thrown on the shippers or receivers, as such, of other goods.

[3] If the traffic would disappear at such higher rates so that they could not be charged, then there is no use discussing the problem of whether they ought to be allowed. The discussion above assumes that the higher rates could be collected and considers merely the problem of whether they should be allowed by the regulating commissions.

Here, again, we are confronted with the question why it is necessary to be more tender with investors in railroads or other public-service industries than general competitive conditions are with investors in competitive industries. A fall in the cost of construction of the necessary plant for undertaking the manufacture of cotton cloth would tend definitely toward increased competition, lower prices, and reduced per cent returns to those who had constructed their factories when cost of construction was high. There would, indeed, be a lag in this adjustment, perhaps of several years, since time would be required to familiarize potential competitors with the fact of reduced costs as well as to get new factories built. Nevertheless, such reduced costs would operate strongly and within a fairly short time, in the direction of reduced price of output. And one feels inclined seriously to question whether there is any better way to undertake the regulation of rates of an industry in which competition is not present than to endeavor so to fix these rates that they will yield the same proportionate return as would be yielded in a competitive industry[6] under similar conditions.[7]

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[4] If anyone is disposed to argue that whenever a higher rate would decrease traffic a lower one might be charged, the answer is to be made that with certain exceptions, most of which the writer has attempted to discuss in *Transportation Rates and Their Regulation* (New York: Macmillan, 1916), such a plan is utterly impracticable and would result in a confusion of discrimination. Thus, if a high rate on wheat would leave some farmers still shipping wheat but other farmers, whose land is poorer or who can more easily and profitably turn to other work, not doing so, by what legerdemain shall we pick out for the high rate those whose land is so good or whose alternatives in other work are so poor that they would in any case remain farmers, and for the low rate those who would move off of the railroad line if the rate to them were kept high? Probably few economists would approve an attempt to introduce such discrimination.

[5] No denial is intended, however, of the fact that the existing development of the community may be dependent, in part, on its having had a railroad in the past. It may be well to point out, also, that the "cost conditions" to which attention is here particularly directed have to do with plant construction. For a consideration of the bearing of any possible dependence of expenses of operation, as such, on the age of the plant, see Section on Depreciation, etc., of this paper.

But suppose the materials entering into the plant to have risen in price so that the present cost of construction is much higher than the original cost. In that case, any growth of traffic necessitating construction of additional plant would practically require[8] rates high enough to yield a return on this higher present cost of construction. The various alternatives among which choice would have to be made would be: (a) to keep rates low, not construct needed additional facilities, and thus artificially check the development of traffic and of geographical division of labor which might be worth much more than its cost, (b) to keep rates low on the old railroad, so discriminating between shippers, and (c) to base the rates of any or all the railroads on the present cost of railroad plant construction. It is perhaps hardly necessary to say that the last is the policy which the writer believes to be wise. In a competitive industry, higher present cost of construction would discourage competition, limit the supply of the article or articles produced, raise prices, and enable those who had constructed their plants when the necessary materials were cheap to make more money. Is there any sufficient reason why a like result should be prevented in a monopolistic industry, when the consequences of such prevention are likely to be as has been herein indicated? Here, too, as when we were discussing changes in the general price level, it may be pointed out that rates in one part of the country based on original cost and rates in another part based on cost of duplication may operate to keep or drive industry away from those very sections where it could most economically be carried on.

The Unearned Increment and Valuation. But the advocates of fixing rates on the basis of original cost rather than that of present cost of construction sometimes present another, though a related, argument which, some of them seem to think, is the strongest argument of all. This argument runs to the effect that to fix rates on the basis of original cost of construction would free the public from the necessity of paying a return on the unearned increment of land values. . . .*

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[6] Cf. the writer's book, *Economic Science and the Common Welfare* (Columbia, Mo.: Lucas Brothers, 1923), pp. 38-39.

[7] This, of course, implies that due allowance will be made for difference of risk, if any.

[8] We are assuming here, dependence on private investment for new construction.

Specifically, what they propose is so to regulate rates as to assure the railroads a fairly high average return; high enough to make up for possible deprivation of the unearned increment. In other words, it is proposed that the rates allowed in the early years of a railroad shall be higher and the net return on investment greater to compensate railroad investors for having the land value on which they are allowed to make return valued at a constant original-cost figure instead of being valued at successively higher figures with the growth of population. In still other words, it is proposed that railroad rates shall be higher (in a growing country where land values tend to increase) than they would otherwise be during the early history of a railroad, and that later they shall be lower than they would otherwise be. The higher rate of return permitted on investment will make the rates higher at the start; but the refusal to count as part of the value of the railroad, on which earnings are allowed, the unearned increment of land, will make the rates lower, as a rule, later, although higher in those exceptional cases where the value of the land declines.

Let us investigate the merits of this proposed policy by inquiring into its probable consequences. To begin with, we may note that the allowing of a higher per cent return at the beginning will tend to discourage trade and, therefore, will tend to discourage the fullest geographical division of labor. Traffic which is worth taking; which is advantageous enough to the community to more than offset its cost; which can pay a rate capable of yielding (allowing for differences of risk in different industries) the current rate of return on investment, is discouraged and decreased because of an attempt to get more than the current rate of return. This involves loss (despite the larger returns on railroad investment) to the community's productive efficiency.

But as time goes on the community develops and the value of the railroad land (terminals and right-of-way) goes up. The railroad land, along with other land, comes to have a higher potential yield and so to have a higher saleable value. Land along the railroad is worth more for other uses than it was. Even some of the land used by the railroad may be worth more for other uses, because of the community development and the growth of population. To keep the land from these other uses is hardly justifiable economically unless the land is equally useful for railroad purposes. But how shall we test its usefulness for railroad purposes better than by the willingness of the public to pay rates for the transportation of their goods, rates high enough to yield the current rate of return upon what the value of the land would be—or upon what the value of adjacent land is—for other purposes? May it not involve economic waste to use land for extra trackage and terminals in order to carry traffic which cannot pay such rates?

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* Editor's Note: Due to special limitations we were forced to omit many of Professor Brown's arguments to the effect that if the accrual of the so-called unearned increment is not allowed in the case of public utility lands it will discourage the building of railroads and will not pass the savings incident to rates being charged on the basis of lower land values on to the public. When such economies in shipping are effected they accrue only to those affected by the particular rates involved. It is only by taxation that the economic rent (which is the basis of these land values) can be given to the whole community. This analysis was further continued in the case presentation (omitted here) under weak and strong roads.

But suppose the community grows and a second railroad is required which, though following a different route and needing its own right-of-way, connects the same terminals. The second railroad has to pay more for land, because of the rise in land value, than the first one paid. If the rates are to be fixed so as not to yield a fair return on what the land is now worth, then the second railroad, though needed, may not be built, and geographical division of labor which is worth much more than its cost may not be permitted to develop.

If, however, the alternative chosen is to allow rates on the new railroad to be sufficiently high so that its construction is profitable, but to keep rates on the old railroad low, then we shall find ourselves confronted with an arbitrary discrimination between shippers. In our fear of letting the earlier-built railroad enjoy an unearned increment, we transfer the gain to a favored group of shippers. Those who can ship by the earlier-built railroad pay low rates. But those who, because the low-rate road cannot carry all the traffic, have to ship by the other railroad are compelled to pay high rates.[9]

Discrimination between places may also make its appearance if the policy of fixing valuation, and therefore rates, on the basis of original cost is insisted on. By this system, as we have seen, rates would have to be higher on the second railroad than on the first. This would mean that towns on the second railroad would be relatively hindered in their development even although various kinds of business could be carried on to better advantage in them than in towns on the first railroad. People would tend to locate their industries in (or to remain in, if already there) the towns located on the first railroad, so long as the traffic did not exceed what this railroad could carry, even although water power or other natural advantages made a relatively greater development of industry along the line of the second railroad best for the community's economic efficiency or wealth-producing power.

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[9] Although there is here an element of special privilege, it cannot be said that the shippers on the low-rate railroad will be able to drive the others from the field. For, by hypothesis, this railroad cannot carry all the traffic, consumers cannot be satisfied except as goods are produced which have to be shipped over the newer railroad, and the prices of these goods must be sufficient to keep the producers of them in business. But at these prices the favored shippers reap an extra gain.

In short, however we look at the matter, a failure to regulate the rates of railroads with due regard for the present cost of plant construction seems likely to lead to economically undesirable consequences. Taxation can be made to secure for the public as much of the economic rent and unearned increment as the public desires to get. Rate regulation to accomplish such a purpose may involve very considerable economic waste. At best it substitutes one group of privileged persons for another. It does not transfer the unearned increment to the whole public. One finds it hard to avoid the impression that many economists are ready to support any kind of paternalistic tinkering in special industries rather than to face frankly the problem of the economic rent of land in general.

But a further possible result of attempting to fix rates on the basis of original cost, and so ignoring changes in land values, needs to be considered. Suppose that instead of an increase of population in a given community, and a rise in land values, there should happen to be a decrease of population and business and a fall in land values. Under such circumstances, if it is still insisted that rates shall be based on original cost, rates must be kept high even although such high rates cause further declines in population and decrease of traffic, so long as these high rates are, on the average, more profitable than reduced rates would be. Even if, finally, over a long period, these high rates completely destroy traffic, they may yet come nearer yielding a return on *original* cost than lower rates would do. For the temporarily larger earnings before traffic disappears, plus interest on these earnings, may more than make up for the later disappearance of earnings. But the community is injured. It may be that, were a new railroad constructed at the lower cost which has become possible because of the decreased value of the land, this new railroad could make a reasonable return on its investment by charging rates low enough to maintain geographical division of labor, to keep the community in question reasonably prosperous, and to prevent continued decline in the population and industry of the community. But if the community must pay rates intended to yield the customary per cent return upon the original cost of the long-ago-constructed railroad, then geographical division which is well worth its present cost will be discouraged, industries which might be able to yield a reasonable return on the present or reproduction costs of *their* plants will languish and die, population will be driven away even although a considerable part of it could more profitably remain, and the net result will be economic waste, lessened wealth-producing efficiency, and loss to the nation as a whole.

Before concluding this section it may be well to examine an alleged difficulty. It is sometimes said that present cost of construction is ambiguous so far as land is concerned, because the value of the land is affected by the presence of the railroad. Hence the question is raised whether the land shall be valued at what it is worth with the railroad present or as what it would be worth with the railroad absent. This difficulty ought not to seem so grave to economists who are familiar with the marginal analysis. We might think of the railroad as being constructed by successive increments and then ask what the value of the land would be in case everything were present but the last small increment of construction—the last switch, station, or station platform space. In truth, the value of the land is a function of natural conditions, and of social growth and development in general, including mining, agriculture, manufacturing, trade, and transportation. The railroads are only a part of the story, and one railroad is frequently only a part of a part. If it be true—as it is not wholly true, least of all in view of the wide extent of water transportation and transportation by auto-truck—that the development of other industries depends on the railroads, it is no less true that the success of the railroads depends on the development of these other industries. If returns in these other industries are measured by and dependent on the present cost of construction of the necessary plants and, therefore, the present value of the land, as they must be in view of what new competitors can buy and construct for, why should not the present value of the land, *i.e.* what it is worth with the railroad or railroads and all other industries at their current development, be emphasized in railroad valuation for purposes of rate regulation?

Depreciation, Obsolescence, and Accounting. A practical objection sometimes raised to the proposition that valuation ought to be on the basis of present cost is that the present cost (of duplication) cannot be ascertained except by a long and costly engineering investigation, while the original cost, including additions and improvements, is, assuming a proper accounting system, a matter of record. Doubtless there is some merit in this contention, and there is here no intention to deny that records, properly kept, may be of great help in valuation for rate-making purposes. Over short periods, indeed, it may sometimes be well to rely almost exclusively on such records. Nevertheless, there is danger that the current cost of plant construction may come to diverge widely from the original cost, and when this is the case, current cost ought by all means to be considered. The records on original investment should never be regarded, therefore, as more than prima facie evidence, subject to modification whenever there is reason to believe that present cost of duplication would be widely different.

This brings us to the problem of depreciation and obsolescence. We have discussed valuation so far as if the proper basis were what it would now cost to construct a plant capable of rendering the desired service. We have made no allowance for depreciation and obsolescence. Yet an old plant is likely to be one which requires more expenditures for repairs, and the time may be near when, if service is to be continuous, renewal or partial renewal of plant will be necessary. If the plant of a railroad (or other public utility) is so far depreciated as to be fairly worth only (say) half as much as a new plant, it does not seem fair to the public to allow rates high enough to yield the current per cent return on the value of a new plant. On the other hand, as a plant becomes older the annual expense for repairs may grow so that a rate which, when the plant was new, would have yielded a considerable return on a large investment now yields a fair return only upon a smaller value. In any case, assuming no change in the price level, population, and land values, or other general conditions, one is inclined to the view that rates should remain constant during the life of a plant. For there seems no special reason why the main burden of paying for depreciation and interest on the plant should be borne by the users of it during its earlier years, nor any special reason why this burden should be borne chiefly by the users of it during its later years. We have shown, in preceding pages, why changes in cost of construction of plant may justify higher or lower rates later than earlier, but we have shown no reasons for such higher or lower rates in the absence of such changes in cost of construction. Other things equal, constancy of rates seems to be the indicated solution.

But constancy of returns on investment, at least after an initial period of building up patronage, is also desirable. The question therefore arises whether constancy of returns, in view of declining value of plant and (probably) increasing repair costs, are consistent with constancy of rates. The position here taken is that there need be no inconsistency. For consistency can be attained through the medium of a properly graduated depreciation fund. How this fund should be graduated, *i.e.* how much should be put in each year compared to the amount put in each other year, would have to be empirically determined for each case on the basis of the probable rate of depreciation and obsolescence, with, therefore, due regard to the approach of a period of relatively high repair costs.

The rate or rates that a railroad (or other public utility) should be allowed to charge ought to be such as, with reasonable efficiency of management, will yield during the life of the plant enough to meet repair costs, replace the plant (or parts of it) when it becomes worn out or obsolete, and yield a fair return on its cost. In general, during the early years of a public utility when the repair costs are low, this rate should yield a return considerably in excess of a reasonable percentage on investment and this excess should go into a depreciation fund.[10] As the period of high repair costs is reached, the net returns from operation will decline, but this decline will be offset by the income from the invested depreciation fund. The amount put into this fund each year should be such as will leave a constant annual sum (assuming no new or additional investment) for dividends, and such as will exactly match, by the increase of the depreciation fund, the decreased value of the plant. Thus, in the absence of changes in the price level, in the prices of materials for plant construction, and in the value of land, there will be a constant charge to the public, a constant net return to the investors,[11] and a constant value for the total property of the company.[12]

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[10] In the earliest years, while patronage is growing, it may sometimes be necessary for investors to be satisfied with a very small yield, not because rates are low, but because there cannot at once be developed business enough fully to utilize a plant of the size that will soon be necessary. Under these circumstances, it may frequently be fair to regard the early deficiency of return as added to the total cost of construction, or duplication, on which later earnings shall be calculated.

The Problem of "Weak" and "Strong" Railroads. It has lately become the fashion among economists specializing in railway transportation to lament the difference between "weak" and "strong" roads and to say much about the alleged difficulty of fixing a rate structure satisfactorily applicable to both. The desideratum is supposed to be to make the "weak" roads reasonably profitable while keeping the "strong" roads from being too profitable. Ordinarily, no difficulty is alleged to stand in the way of the desired solution when the "weak" and "strong" roads serve entirely different communities. The apparent solution in that case is to lower the rates on the "strong" road (if its "strength" is due to dense environing population, level roadbed, and other favoring conditions, rather than to unusual efficiency of operation) and to raise the rates on the "weak" road. Unless effective wealth production is to be hindered, business should be encouraged to locate where conditions are, in general, most favorable. So far as natural resources advantageous for business, or relative undercrowding of available land and resources, offset the higher costs of transportation along the lines of the "weak" road, it is desirable that business should locate there. But if the real cost of transportation is higher, the rate should be higher, in order that business should not be encouraged to locate on such a road to a greater degree than social economy justifies. Any scheme of consolidation of the "strong" and the "weak" roads advocated on the assumption that higher earnings of the "strong" part of the consolidation are going to offset lower earnings on the "weak" part so as to permit low rates on the latter, is a scheme for an indirect bounty from the more favored regions to encourage the business development of the less favored, and the adoption of such a scheme is likely to bring about economic waste and loss.

But this very sort of policy seems to be desired by some present-day writers, when the "weak" and the "strong" roads are in the same general territory and connect some of the same points. . . .

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[11] After a possible initial period of development of business up to plant capacity. See footnote 10.

[12] This result might sometimes be accomplished by investing the depreciation fund in additional plant so that, instead of an entirely new plant, there would be eventually a plant mostly not new but larger.

119. Valuation: the Determination of Expense Levels *

In . . . the general theory of regulated monopoly price, prices should be fixed so as to permit the monopoly to earn a normal competitive net return to the capital actually invested in the business, or prices should be fixed so as to allow the monopoly to earn a total return equal to aggregate expenses of production. This may be called the investment theory of valuation. We have now to consider the elements which comprise aggregate expenses.

Elements in Expenses. The determination of total expenses requires (1) the valuation of items, physical and non-physical, properly entitled to a return; (2) the valuation of operating expenses, or the standardization of operating costs, and (3) the valuation of the rate of return. In other words, what items, tangible and intangible, are properly entitled to a return, what value should be placed on them, what are legitimate operating expenses, and what is the proper rate of return?

Past and Present Conditions. The problem is complicated by the fact that a theory of fair value applicable to present conditions may have to be materially modified in its application to past conditions. . . . For instance, the investment theory excludes all donated items from value. Such items represent no expenditure on the part of the monopoly, and no claim to a return on them may be urged. As applied to the present, no objection to this contention can be maintained successfully. But to assume that a retroactive application is just, is at least, a rather violent assumption. Certain equities may have been established which justice must recognize. Consequently, we must always keep two problems in mind: What value will establish conditions of equal opportunity to produce in the present? And what disposition must be made of equities established in the past? Although it may well be that the equities are the result of past inequalities, we cannot remedy one injustice by creating another.

In general, we think it can be shown that any retroactive regulation is unjust. If this is true, the investment theory applies only from the beginning of regulation in any particular case. But the reasons for this conclusion are so varied, and the problem is so important, that we take it up in connection with the various items in valuation.

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* Excerpt H. B. Whaling, *Fair Value—Economic and Legal Principles* (Bulletin of the University of Wisconsin, No. 934), Chap. III, pp. 43-57, 73-74; (Economics and Political Science Series, Vol. IX, No. 3), pp. 415-429, 445-6.

Substitute versus Present Plant. Tangible items include capital goods and land. The investment theory includes only those tangible items that are properly chargeable to capital account under scientific accounting methods. Book value, inflated by unwise or fraudulent outlay, is not a criterion of investment. Only those expenditures which would normally afford a return under the full application of the law of comparative costs can be legitimately charged to the capital or counted in value.

This position may seem to lead to cost of substitute plant rather than present plant as the criterion of investment, but such is not the case. It is evident that to use cost of substitute plant as the controlling element would increase heavily the risks of business and thus raise the general level of expenses. And while the use of present plant as the basis of investment results in temporarily higher expense levels, the fact that certain risks are eliminated results permanently in lower levels of expense. Thus by adopting present plant as the basis of value calculations a sort of insurance is created. The temporarily higher expense levels, due to retaining the old plant, are analogous to insurance premiums, and the policy has the same economic justification that all insurance has. Investment, therefore, is measured by present plant.

Unit Prices. A general problem of much significance is that of unit prices. What prices are to be used in fixing the value of items which are properly entitled to a return? Under the investment theory, actual prices at the time of construction may be used. If so, it is clear that the value thus obtained must be affected by a weighted index of price changes constructed of pertinent items. The same result may be obtained if present prices are applied to actual construction conditions. This method automatically has the effect of applying a weighted price index constructed of appropriate items and is, therefore, a superior method.

In applying present prices, sometimes an average is fairer than current prices and sometimes current prices are fairer than an average. The advantages of an average are obvious. Averages avoid extreme fluctuations in market prices and, therefore, tend to approximate closely the actual conditions under which normal construction takes place.[1] Avoiding price fluctuations is conducive to more stable rates—a most desirable condition [2]—while the using of current prices, which may be abnormally high or abnormally low, may work injustice to the consumer or to the investor.

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[1] R. H. Whitten, *Valuation of Public Service Corporations* (New York: Banks Law Publishing Co., 1924), p. 202.

One- or two-year averages reveal only surface fluctuations and usually mean frequent rate adjustments. Five- or ten-year averages disclose more significant price variations coincident with economic changes and are ordinarily favored.[3] An average based on an assumed construction period seems to bear no particular relation to any significant fact and is, therefore, not of much importance.[4] In fact, all averages may be unfair to the regulated company. This case arises when prices are not merely fluctuating but show marked tendencies to rise continuously, as in the case of materials constructed from forest products. In this case, future conditions may be best cared for by using current prices. Such current prices would, of course, not be current market prices, but normal prices discovered by the use of projected curves.[5] . . .

Physical Items—The Inventory. The first step in discovering investment is an inventory of the physical items used and useful for the public. . . . Moreover, the inventory may reveal items which do not represent any outlay on the part of the investor. On the other hand, expenditures made by the investor may not be revealed in the inventory. . . .

Investment In Excess of Present Needs. In anticipation of growing business, land and plant may be acquired in excess of immediate needs. In the case of land three possible ways of dealing with this situation present themselves. In the first case the excess land may be counted in value. The consumer takes the risk, and any appreciation in land should accrue to him and depreciation be borne by him. In the second case, the land may be excluded from value. Then the investor assumes the risk, and when the land is actually used it should be included at its full value at the time. In the third case, the land is entered in value at the time it is acquired, a full return is allowed on it, and appreciation is counted as income.[6] This last position is obviously a compromise position. Theoretically, the first two are more tenable. Either the risk should be borne by the consumer or it should not. The cost side of the problem decides here. It would undoubtedly be very costly to regulate the purchase of land for future needs. Moreover, the delay incident to commission decision in any particular case might prevent the taking advantage of favorable conditions of purchase. We, therefore, think that land ought to be excluded from value until it is actually used and then counted at its full value at that time—as would certainly happen under normal competitive conditions.

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[2] *Hill* v. *Antigo Water Co.*, 3 Wis. R. R. Com. Reports 623, 639 (1909).

[3] Whitten, *op. cit.*, p. 204.

[4] Whitten, *op. cit.*, p. 206. Mr. Whitten here quotes from an article by H. L. Gray, in *Engineering and Contracting*, May 3, 1911, pp. 520-1.

[5] H. E. Riggs, in *Proceedings*, American Society of Civil Engineers, Nov., 1910, p. 1506.

[6] This is the position of the New York Public Service Commission. See case of Queens Borough Gas and Electric Light Co., 2 P.S.C. 1st D.

In order to avoid heavy inadequacy charges, it is ordinarily necessary to build plant in excess of immediate needs. This excess plant becomes a legitimate part of capital account, and must be allowed in value. This, of course, assumes that reasonable judgment has been used in building for the future.

If a plant far in excess of any probable use for this or the next generation has been put up, it falls under the head of unwise expenditure and is not allowed. The whole problem hinges on the question of reasonableness, to be interpreted in each particular case. Should it finally prove that the excess plant is not going to be useful in the service of the public, although a return may have been allowed for a time, it must eventually be excluded on the ground of unwise expenditure. This is merely a risk private enterprise must bear, and regulated business cannot escape the results of bad business judgment.[7]

Invested Surpluses. A surplus is an excess over a fair return. Theoretically, of course, invested surpluses have no place in value. Profits in excess of a fair return should be distributed to the consumer in lower rates, or, what amounts to the same thing, reinvested and considered as a sort of public trust upon which, of course, no return is to be expected, except a small one to cover entrepreneurial costs of handling. Thus we do not invade investment; nor do we put any business in a position less favorable than it would be under normal competition. But, decidedly, we do deprive monopolies of their peculiarly exclusive position. As applied to the future this position will, undoubtedly, be accepted.

As applied to the past, other considerations enter to modify the above position. Invested surpluses have become the basis of relations between the public and the investor. They have been capitalized; benefits have been conferred; equities have been established.[8] The excess put into improvements has reflected itself in the market value of stocks and bonds, and investments have been made accordingly. Retroactive invasion of these investments cannot be justified on the ground that consumers have paid more in the past than they would have been required to pay under proper schemes of regulation. Granted that they have, it is difficult to see how remedying past inequalities can be accomplished by creating new ones, and this is just what would happen if the investor is pillaged for the benefit of the consuming public. The end in view may be wrought by means of proper treatment of inheritance and property. Thus the innocent investor escapes, but the manipulator who has come out with a large fortune is finally reached. We conclude that past invested surpluses are to be allowed in valuations.

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[7] *Spring Valley Water Co.* v. *San Francisco*, 165 Fed. 667, 697 (1908). Whitten, *Valuation of Public Service Corporations*, pp. 198-200.

The question now arises as to the validity of permitting surpluses which are invested as public trusts. The main objections urged against the accumulation of such a surplus are (1) that it is provided out of excessive charges to the public for service, (2) that it tends to extravagance in operation, on the theory that close margins tend to greater economies, and (3) that it affords a way of giving exorbitant and unreasonable dividends to the shareholders by some form of distribution of the surplus from time to time.[9]

In so far as the first point is concerned, there are obvious advantages in the surplus: (1) it strengthens the credit of the company by enabling it to make interest and dividend payments regular and dependable, (2) this enables the company to get capital for extensions, etc., on most favorable terms, (3) it enables the company to weather commercial and financial disturbances, (4) it enables the company to give the best quality of service in that it does not have to adjust more or less inflexible operating expenses to highly flexible income due to fluctuations in business; it is a reservoir supplied by a fluctuating stream of income, and enables the company to maintain uniform service and permanent operating force which lends itself to greater efficiency, and (5) it lends itself to stable rates, which is highly desirable.

There may be some truth in the second point. But under constant regulation there is no particular reason why interest charges and operating expenses should not be controlled in such manner as to prevent extravagance in operation. It should be no more difficult to control these expenses under the policy of allowing a surplus than it is to discover whether a surplus is being covered up in padded operating accounts where no surplus is permitted. Moreover, one may just as well assume that a possible surplus will be covered up as to assume that a surplus will lead to extravagance, for the result on rates would be the same. Furthermore, each position assumes the same degree of integrity in the management of a corporation. It is reasonable to assume that the usual $50,000 man will run a business about as efficiently as he can, regardless of surplus. It may be true, then, that when returns are running lowest, efficiency is most sought; but it seems equally true that the policy of allowing a surplus will not lead to any great degree of extravagance.

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[8] *Spokane* v. *Northern Pacific Railway Co.*, 15 I.C.C.R. 376, 415.

[9] Report of the directors of the American Telephone and Telegraph Company, March 20, 1912, pp. 8-12.

The third point is answered in the original question. The fund is to be regarded as a public trust or public investment, and no return on it may be expected by the public business.

This policy amounts in reality to forcing the public to purchase an interest in the regulated business. If the rate of return allowed the monopoly is adjusted, with relation to competitive businesses, according to risk, the effect on total expenses over long periods of time is nil. In general, since force implies the absence of free exchange, it is doubtless unsound to compel present consumers to provide funds which might be supplied as capital by the monopoly. Nevertheless, the beneficial results of the surplus seem to justify this particular policy.

Donated Items. As regards future policy, since donated items represent no outlay on the part of the regulated business, they should be excluded from value. But as regards the past, such items, in so far as they have become the basis of established equities, must be allowed.

Adaptation and Seasoning. An old and seasoned road-bed is undoubtedly worth more than a new one. The criterion of this is the fact that maintenance expenses are less. Theoretically, of course, the earlier heavy expenses of maintaining and repairing road-bed may be looked upon as operating expenses, in which case actual cost would be the criterion of investment. Or, additional value due to seasoning may be considered as a proper capital charge, in which case no allowance for such expenditures would be made in operating expenses. The effect on rates would not be different in the two cases, but it is usually preferable, in order to spread costs over a long period of time, to avoid classing as operating expenses charges which may readily fall under capital account.[10]

As regards the past, since neither past earnings can be taken nor past equities distributed, and since the lowered operating expenses have necessarily expressed themselves in the value of securities, nothing can be done. A valuation now must consider the roadway at its appreciated value. This would be determined by the amount of money put into the roadway whether the money came from earnings or capital. The position is exactly similar to that taken in the case of invested surpluses.[11]

Plant adaptation also is a proper item in value. It is impossible to avoid imperfections in the building of a large plant. Expenditures for the purpose of adapting plant to function are necessary, and the amount of such expenditures becomes a proper expense and clearly ought to be allowed in value.

Working Capital. The mechanism of modern business often requires a temporary excess of expenditures over receipts. The funds necessary to finance such a condition are called working capital, and obviously such capital is a proper cost of service. Some difficulties in finding the actual amount of working capital may be experienced, but there is no theoretical difficulty at this point. No questions of past and present arise, for this is always a present item. Consequently, no matter what theory of fair value one may adopt, whether actual cost, investment, reproduction cost, or what not, the result would be the same in this case: the actual amount of capital necessary to finance the excess of expenditures over receipts.

Expenditures for Other than Railway Property. This class of items includes all expenditures made by a railway, or any other public utility, for items which are not a part of the utility business. Among them are expenditures for the elimination of grade crossings, paving, etc. If such expenditures are made by the utility they must be allowed in value—either in capital or in operating expenses. In either case, the result is to throw the burden of these civic improvements on those who use the utility, whereas many other people are benefited by the improvements and should bear a part of the costs. The practice has, consequently, no theoretical justification.

In the days of unregulated monopoly, justification for such a policy lay in the fact that a blanket tax on monopoly returns could not be shifted. Consequently, this was a means of getting a part of monopoly surplus, but under present conditions of regulation the practice is indefensible.

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[10] Whitten, *Valuation of Public Service Corporations*, Chap. 16, gives the position of courts and commissions in this matter.

[11] Road-bed seasoning is peculiarly a transportation problem.

Since no equities can have been established on expenditures of this sort there is no reason why they should be included in value, unless it can be shown that no fair return was earned by the utility prior to regulation. Such a condition indicates, not a tax on monopoly surplus, but a taking of reasonable profit. In general, the presumption is strongly against allowing such items. But in the present, if the practice is followed, such items must evidently be allowed in capital or in operating expenses; preferably in capital, for this spreads the burden of the payment over a greater body of consumers. However, if allowed in capital, the item would have to be amortized during the life of the items, or else the present generation would unduly pass charges on to future generations.[12]

Certain Hypothetical Items. Chief among these items are condemnation multiples and increased cost of reduplication due to expenditures on the part of states or municipalities.

Undoubtedly, the cost of right-of-way is a legitimate element in value. But this is no reason for adding some two or three hundred per cent of the estimated value of the land to cover hypothetical condemnation multiples. If these expenses were actually undergone, they should be allowed.[13] It is quite true that a public utility is ordinarily compelled to pay more for land than its market value, which fact is of great significance in valuation. On the other hand, much land is donated. One cannot therefore argue with the reproductionists that, since at the present time it would probably require the multiples to get the land, it may be assumed that the multiples were used, or that, since a producer now entering the field would probably have to pay the multiples, they should be allowed to the existing company. Nor can one successfully argue that unless these items are allowed, a competitor cannot enter the field. It is granted immediately that a competitor cannot enter the field. It is not desirable that one should.

There is only one possible way to deal with condemnation expenses, to wit: find out just what such expenses were and allow them.

Another important class of hypothetical items includes increased costs due to difficulties of reproduction. A city may have paved certain streets with the result that it would cost more now to reproduce certain parts of the utility plant than it actually did cost in the first place. When it becomes necessary to replace the part of the plant in question, then these items may be taken into account.[14]

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[12] Whitten, *op. cit.*, p. 167.

[13] Whitten, *op. cit.*, p. 127.

But to add an amount to cover potential costs of this sort is to allow a return to the regulated company above anything a competitive investor hopes for or gets. It is to establish unequal production opportunity. Moreover, the taxpayers put down the payment and then the consumers pay the utility company for being so fortunate as to have such taxpayers in the community. . . .

Appreciation in Land Values. Aside from the appreciation in land value due to changing price levels of which we have disposed, there appears a large increment in value due to growth of population. Is this entitled to a return?

This appreciation may be treated in three ways: first, it may be capitalized and allowed in price; second, it may be counted as income or a reduced return allowed; and third, it may be excluded altogether, and a return allowed only on the actual investment in land.

A very brief consideration of the principles governing the valuation of land will furnish the answer to this problem. Land value is the sum total of the present worths of a series of discounted future estimated incomes. There are thus two elements in it: present income and estimated future income. When one sells land one capitalizes the estimated future incomes, and when one buys land one pays for these capitalized incomes. Normally, the total return of land investments, composed of present income and estimated appreciation or depreciation, is about equal to the return to any other form of investment of a similar degree of risk. The full return is realized only by selling the land or by holding it until rents rise sufficiently high. In no normal case is the final amount obtained from land investment greater than the amount from any ordinary competitive investment.

It is clear that the first contention, capitalization of appreciation, permits a double return to public business; a return which could not be had under competition. The fact that it can be had in the case of regulated companies is indicative of monopoly position. To permit the appreciation is to capitalize monopoly situation. Since this is the very thing that equality of opportunity requires be abolished, there can be no justification for such policy.

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[14] The classical illustration of this point is "pavement over mains."

A peculiar argument for allowing appreciation rests on the fallacy of competitive roads. The argument runs as follows:

> "A failure to allow for such increment would be an injustice to a new competing line and would discourage competitive building. This is illustrated where a new company, in a given locality, say in a large city, would have to pay for necessary terminals several million dollars more than an older line with a similar amount of property, it being generally true today that the cost of securing right-of-way and terminals has greatly increased over former years. Other things being equal, in the process of rate regulation and competition, the rates charged by each being necessarily the same, if the older road were not allowed the increased value of items terminals to correspond with the new company, then its rates, based on the lower value, would, by competition, govern the new road, which would be deprived of reasonable returns on the value of its property. Such a policy of rate regulation would discourage competitive building, under such conditions, although the existing line might not be able to properly care for the business offering."[15]

This is one of the most perfect illustrations of illogical statement one may hope to find. It assumes the desirability of competition in the characteristically monopolistic railway business. One is surprised to find the date of the statement as late as 1910. It establishes a permanent differential return which could not exist under competition where always the more efficient producer tends to drive the less efficient from the field. The truth is, if eliminating appreciation in land value would discourage competitive building, most students of transportation would at once urge its elimination.

The second contention, that is, counting appreciation as income or allowing a reduced return, seems more sound. If the normal rate of return to investments is 8 per cent and if land appreciates at the rate of 5 per cent annually, investors can be found who will pay a price for the land which will give them a cash return of a little more than 3 per cent in the present. The return is a little more than 3 per cent because interest is charged on the unrealized income tied up in appreciation. In the case of utilities, it is argued that equal treatment is afforded if the same cash return is allowed as investors are willing to take. Appreciation is thus counted as income.[16]

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[15] *Proceedings of the National Association of Railway Commissioners*, 1910, p. 141.

There are serious objections to this method. In the first place, it involves the additional interest charges due to unrealized income. In the second place, it does not accomplish its purpose as can readily be shown by certain assumed figures. We may leave out of account interest due to unrealized income in the illustration. Assume the following conditions:

	1890	1910	1930
Land			
Value	$100,000	$200,000	$300,000
Income	10,000	20,000	30,000
Building, etc.			
Value	100,000	100,000	100,000
Income	10,000	10,000	10,000
Present Value	200,000	300,000	400,000
Total Income	20,000	30,000	40,000

Suppose that $200,000 in 1890 represents the actual investment, and assume, for mere ease in calculation, that 10 per cent is a fair rate of return. In the illustration, land appreciates in value at the rate of 5 per cent per annum. Suppose a valuation made in 1910. Since $300,000 represents value at that time, $30,000 will be allowed as income. Of this amount appreciation will be $5,000 or a cash return of $25,000. This is 12½ per cent on the actual investment of $200,000. If the valuation be made in 1930, a cash return of $35,000, or 17½ per cent, would be allowed. Thus, counting appreciation as income does not seem to approximate the investment theory. Always, if the rate of appreciation in land is less than the fair rate of return, and it must always be so, the method fails in favor of the regulated company. If one could conceive normal land appreciation at a greater rate than fair rate of return—under such conditions of course one would pay for the opportunity of investing in land and expect less than nothing as immediate return in cash—the method would be unfair to the public utility. It is only when the two rates happen to coincide that the method approximates the conditions of the investment theory. The two rates would correspond, in theory, when no immediate cash return is expected from land investment. In practice, the rate of return allowed public businesses should be equal to what could be had in other opportunities, assuming risk always. Since there is always, except in the case of unproductive land held for purely speculative purposes, some cash return to land investment, it is clear that the method is unfair to consumers of public utility services.

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[16] *Steenerson* v. *Great Northern Railway Co.*, 72 N.W. 713, 718 (1897). *In re Gas and Electric Rates of the Queens Borough Gas & Electric Co.*, 2 P.S.C. 1st D. (N. Y.) (1911).

Moreover, the method would carry with it all the difficulties of corporate reorganization. It would not be difficult to reorganize and capitalize the appreciation in value. This might be prevented by accurate regulation, but there is no necessity for creating the problem.

The third contention, excluding appreciation in land value altogether, comes closer to meeting the requirements of the investment theory. In this case original cost is taken as fair value and a normal return is allowed. Since this is exactly what any investor in other enterprises gets in the normal case, it appears that equal treatment is attained.

However, if appreciation is excluded, depreciation must also be excluded, and thereby a risk of business is removed. Thus not only do we eliminate the higher expense levels embodied in the other methods, but in a positive way reduce expense levels still further by eliminating an element of business risk. . . .

Bond Discounts. Three elements may be present in bond discounts: brokerage charges, deferred interest, and poor credit.[17]

Brokerage charges may be defined as the ''expense necessary to be paid a reputable broker for making a full investigation into the costs and prospects of an inviting public service enterprise and a reasonable compensation for inducing his clientage to invest in well secured bonds and securities of such corporation.''[18] This item is clearly a cost of the service to the public. All this assumes, however, that the relation between bonds and stocks is reasonable. If a company should attempt to finance its whole construction by bonds, this would, evidently enough, not be a legitimate financial transaction and bond discount would be excluded from value. Probably bonds should not often exceed 50 per cent of the total outstanding securities or rather investment. With the growth of regulation, this percentage may well rise to 70 per cent or even to 75 per cent of investment, for regulation should always have in mind the approximation of investment rather than speculative conditions for public utilities.

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[17] Capitalized risk might appear in bond discount. But it is undoubtedly preferable to take care of this item under stock discount.

[18] Whitten, *Valuation of Public Service Corporations*, p. 268.

A normal brokerage charge is about 5 per cent of a bond issue. . . . If the amount paid exceeds 5 per cent there is prima facie case against allowing the excess.

Aside from brokerage charges, discount may be due to monetary conditions. If the ordinary interest rate on well secured bonds is 5 per cent and bonds are issued at 4 per cent it is evident that such bonds would sell somewhere around 85. This sort of discount is equivalent to deferred interest payment. Interest at 4 per cent plus a fund accumulated to pay off the discount at maturity would amount to 5 per cent. The total payment made by the consumer would not be different in the two cases. Fluctuations in the money market necessitate selling bonds below par. There can be no doubt of the legitimacy of such a transaction, and the discount should be cared for in rates.

The money market may fluctuate so as to cause bonds to sell above par. In this case the premium should accrue to the consumer who must pay the interest charges.

Bonds may sell below discount because of bad credit. In this case if the discount is taken care of in capitalization or in rates, the poorer the credit of the company, the higher the capitalization or the higher the rates. In fact, the consumer should pay nothing for poor credit, no matter to what it may be due. If it exists, the investor should suffer any resultant loss.

Where outstanding bonds, or bonds and stocks, are grossly in excess of investment, no consideration should be given to bond discount in general. It is clear that bonds and stocks must bear a reasonable relation to investment before any general allowance for discount is legitimate. However, a reasonable brokerage charge on that portion of the bonds which do bear a reasonable relation to investment may properly be allowed.

Franchises. In cases where franchises have been paid for openly by the public utility they must be allowed in value. The practice of charging for franchises is not general and should be discontinued for it is manifestly a vicious method of taxation. Since the function of a franchise is to guarantee investment permanency, it should be considered only in a purchase case.

Risk is a cost of production that must be paid by the consumer. This problem is treated in the section on the rate of return.[19] . . .

The economic principles (underlying the rate of return) are not complex, but the practical application of them presents serious difficulties. Theoretically the rate of return, assuming actual

[19] *Infra*, p. 78.

investment as the basis of return, should be that rate which will draw into the business that amount of capital which would flow into such businesses under the operation of the law of competitive costs. . . . The test of the adequacy of such a rate is whether railway building keeps pace with estimated economic needs.

The rate corresponds closely to the competitive rate of return with certain risk adjustments. But the importance of the railway business requires over-building rather than under-building, and care should be taken not to bring about a condition of stagnation. It is better to err in the other direction. . . . In building a public utility enterprise risks are encountered at two different stages in the development of the property. They are first encountered in the initial steps of bringing the property into existence and later in making extensions and developments.* . . . No matter how thoroughly risk may be eliminated after a plant is well developed, the fact remains that the undertaking of new enterprises (or making new extensions or developments) is always accompanied by more or less risk. Uncertainty as to what the initial investor may expect or the owners of the property when extensions are being made leads to a failure to undertake initial risks. Regulative policy should, therefore, be definite in the matter. . . .

Regarding the assumption of these risks two different theories are advanced. The first calls for a capitalization of the risks, while the second believes that this cost should be amortized through high returns over a relatively short period. . . .

Both of these accounts of the problem recognize risk as a cost of production that must inevitably be paid by the consumer. They differ in the method of payment. The former holds out for capitalization of risk; the latter contends for rapid amortization of risk. The capitalization method makes a more definite offer in that it fixes a certain lump sum which is more tangible than the mere offer of higher returns and, therefore, has the advantage of certainty. It also appeals to investor psychology in that it offers opportunity for enhancement of property values. Stock bonuses, and the fact that $100,000 worth of 3 per cent securities will sell for more than $50,000 worth of 6 per cent securities, other things being equal, are evidences of this phenomenon. We do not attempt to explain this psychological fact; we merely note it. It may be urged that the capitalization method distributes the cost of the service rendered by a railway, for instance, over a longer period of time and that from the social point of view, since those who come after are to use the plant, this is desirable. On the other hand, it may be said that the risk is a cost which does not embody itself in any physical item and disappears with the development of the company. It may be urged, therefore, that it ought to be paid by those for whom it is undergone, as other risks will have to be paid in the future by those for whom they are undertaken. This position might well be used by the capitalizationists, for they would merely say that the risk was undertaken for all those who use the plant, and in the case of permanent plants, risk should be spread over the whole life of the plant by capitalizing it.

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* Transitional summary sentences by the editor.

Of the two methods, theoretically, it may be said that the one which offers greater certainty, other things being equal, is the more sound. This position would lead to the capitalization method. It seems to offer greater certainty and, therefore, to eliminate risk. From two points of view then risk should be capitalized. First, it tends to lessen the general level of expenses by affording greater certainty; and, secondly, it spreads the total risk cost over the whole body of consumers for whom it was undertaken.

The appeal to all classes of investors tends to lessen the general expense level. The appeal is made, of course, through the issue of various grades of securities bearing different rates of return according to risk. By the speculative class probably a return of less than 8 per cent to 12 per cent would not be considered. The conservative class is willing to take 4 per cent to 5 per cent, but is unwilling to take the risk. Therefore, it would be impossible to finance a new enterprise, or an extension, at 4 per cent to 5 per cent and it would be unnecessary to permit a general return of 8 per cent to 12 per cent as there is usually a percentage of the total investment which is secure enough to attract the 4 per cent to 5 per cent class. Thus by issuing various grades of securities it is possible, through risk allocation, to vary the rates of return in such manner that the level of expenses is reduced.

120. Going Value *

Going value is an intangible item in public utility valuation which has attracted widespread attention and discussion. Yet today it remains one of the seemingly insoluble and least understood elements encountered in the development of principles of

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* Adapted from J. D. Sumner, "Going Value: Its various interpretations and their validity," *Journal of Land and Public Utility Economics*, IV (1928), 59-70.

rate-making valuation. Indeed, it may accurately be designated the most intangible of the many intangible elements encountered in valuation cases. As the situation is described in a typical statement, "There is no element in public utility valuation as to which there is greater vagueness and confusion than this so-called going concern value. The courts recognize that some value ought to be added to a going concern over the bare bones of its physical structure, but they do not seem clear as to how much should be added or on what basis the amount to be added should be ascertained."[1] . . .

What Is Going Value? The first question which logically presents itself, therefore, concerns the nature of going value. The matter of definition is vital to the discussion of most problems in economics. . . . The many ways in which going value has been construed make definition a particularly essential point of departure in this study.

The following classification of the meanings in which the term has been employed have been adopted as being most useful and representative. However, it should not be considered a complete index of definitions.[2] Going value has been described: (1) as an element similar to, if not identical with, good-will; (2) as simply that intangible attribute of a public utility which is established and successfully operating, with a profitable business and customers attached, compared with a utility which has not yet "won its spurs"; (3) as a differential: (a) between the market or sales value of a public utility and its appraised value as a successfully operating physical entity, or (b) between its appraised value as a successfully operating physical entity and the sum of the appraised values of the various distinct and *separable items* of tangible property; and (4) as an amount representing the necessary deficits sustained, or "income necessarily foregone" by a utility, during its development period.[3]

Going Value as Good-Will. In the maze of judicial opinions regarding valuation for rate-making purposes, there is no term which is apparently more uniformly construed than "good-will." Good-will is universally excluded, at least when that label is attached.[4] . . .

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[1] *Re Marin Municipal Water District* (California), P.U.R. 1915-C 433, 471.

[2] An excellent discussion of the various senses in which going value has been employed is to be found in *City of Springfield* v. *Springfield Gas & Electric Company*, P.U.R. 1916-C 281, 358 (Ill. Commerce Com.).

[3] It has been suggested as a result of recent court decisions that going value is simply a concept which may prove useful to commissions and regulatory bodies in dispensing equity in valuation—an intangible something which may be added or refused at the discretion of the legislature or its agent to deal out justice in hard cases. See M. G. Glaeser, "Some Aspects of the Going Value Concept," *Journal of Land and Public Utility Economics* I (October, 1925), 435-443.

Good-will is ordinarily considered an item of value because it represents a factor of additional earning power. Other things being equal, a company with good-will earns more than a company without good-will. But in a rate-making valuation, when a basis for earnings is to be determined, to allow any item which depends upon earning power for its amount and validity is clearly to indulge in circular reasoning. A cause of earning power should not be used as a basis for earnings.

In a number of cases, however, the courts have shown a tendency to allow for going value in a sense that is remarkably similar to good-will, although it is never given that designation [5, 6] and termed good-will, but some sound suspiciously like it. . . .

Going Value as the Attribute of a Utility Organized and in Successful and Profitable Operation. This construction of the subject is difficult to analyze. It may be our friend good-will in disguise. It may, in fact, represent valuation on the basis of earning power. It may mean exceptional management and efficiency, or it may represent a confused nothing.

It would be fruitless here to illustrate all the different turns and connotations of going value of this general nature which are found in the decisions of various courts and commissions. As has been said in a recent commission case,[7] "What is going value appears to be in a nebulous state so far as it can be determined from the decisions of many courts and commissions." A few examples will reveal how meaningless are some of these statements.

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[4] Judicial opinion in regard to its allowance is well expressed in *Wilcox* v. *Consolidated Gas Company*, 212 U. S. 19, 52. "We are of the opinion that it is not a case for a valuation of 'good-will.' . . . The complainant has a monopoly in fact, and a consumer must take gas from it or go without. He will resort to the 'old stand' because he cannot get gas elsewhere. The court below excluded this item, and we concur in that action."

[5] *McCardle* v. *Indianapolis Water Company*, 272 U.S. 400, 414 (1926). "Consider its earning power with low rates, *the business it has attached, its fine public relations, its credit*, etc. . . . These things make up a value that is real and not speculative."

[6] E.g. *City of Springfield* v. *Springfield Gas & Electric Company*, 291 Ill. 209; 125 N.E. 891 (1919); *New York Telephone Company* v. *Prendergast*, 300 Fed. 822; P.U.R. 1925-A, 491, 497, in which the court gives a rather naïve discussion of going value, concluding that "it is found that this plaintiff was created and does function, and functions very well; therefore, it has going value, because it goes well. The amount may be difficult of ascertainment, but that going value exists is self-evident."

[7] *Re New York Telephone Company*, P.U.R. 1926-E 50.

One commission, after refusing to make any going-value allowance on the basis of early losses, goes on to say: "We do feel that we should give consideration to the difference in the value of the gas plant as it now stands with its customers attached and what the bare plant would be worth without its customers attached."[8] . . .

Just what the commission has in mind baffles analysis. . . . Overheads and the cost of developing the business are excluded by the fact that the same commission has made specific allowances for the former[9] while the latter is an operating expense which logically should be considered as a cost only when a deficit is necessarily incurred in building up the business. . . .

The only other possible interpretation of this and similar allowances is that the commission has in mind the difference between the original or reproduction cost of a property, and the amount the property would bring on the market in view of its established operations.[10] The fallacy and circular reasoning involved in such an allowance is as clear as it is in the case of goodwill. Market value results from and is ordinarily measured by earnings and earning power. To use it as a factor in measuring the amount of going value allowance, which is to be added to the rate base of a utility and thereby used as a basis for future earnings, is a fallacy sufficiently obvious to require no further elaboration.[11]

Another example of the fallacy of allowances of this nature is the following statement by a state commission, in which the uncertainty of meaning is striking: "That going value, that is, the difference in value between a going concern with an established business, and a plant completely assembled but without customers, is an element of value which must be taken into consideration in arriving at the fair value of the property of a utility for rate-making purposes, is no longer open to question. Such value must be fixed in a more or less arbitrary way, yet based upon all pertinent facts and circumstances in each particular case. In this case we are of opinion that an allowance of 10 per cent for this element of value is not excessive.''[12]

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[8] *Re City of Sault Ste. Marie* (Michigan), P.U.R. 1921-E 321, 326.

[9] *Re City of Lapeer et al.* (Michigan), P.U.R. 1923-B 736, 739, 740.

[10] That this may be the actual thought in the mind of the commission is perhaps indicated by its statement at the end of a similar discussion. "In the case of sale and purchase, there is no doubt as to which of these two utilities (one with customers and which is a going concern and one which is not so developed) would command the larger sale price, all other things being equal." *Re City of Lapeer, supra,* n. 9, at 740.

[11] Contrast with *Minnesota Rate Cases,* 230 U. S. 352, 458, 459, 461 (1913).

The actual items or amounts for which the commission wishes to make allowance in this case are not apparent. Whether allowances should be made for items which are not even defined by the regulatory authorities seems at least open to question. As pointed out above, if this difference between the value of an established and going concern and the value of a plant completed but without a business attached represents the difference between actual cost, either original or reproductive, and market value, it clearly is not a logical element in a utility rate base. And if this is not the difference meant, what is it? Costs of developing a business are proper operating charges. If they have resulted in early losses or deficits below a fair return, that fact may well be introduced as evidence of going value. Otherwise, is it not fair to assume that such expenses have already been met from earnings?

The logic of this proposition is clearly brought out by the Indiana Commission in Fort Wayne *v.* Home Telephone Company,[13] a case in which a separate allowance for going value was reluctantly made by the Commission: . . .

> There is no fundamental incompatibility between the two familiar theories of going value, viz. (1) "dry bones and living body" and (2) "cost of developing and attaching the business" . . . financing and organizing the business and developing and attaching the patronage are what make a living body out of the dry bones. The two theories are merely different aspects of the same thing and are to be measured in the same way. If any further meaning is to be attached to the former theory, it is on account of "good-will," which, it is generally agreed, is not an item on which a utility is entitled to a return. . . .
>
> In the opinion of this Commission, there is no warrant in equity for making an allowance for going value *where the cost of development included in operating expenses was not so great as to prevent the utility from earning a reasonable return on its investment.* . . . (*Italics ours.*)

Going value has sometimes been construed to include to some extent superior management, efficiency, and other managerial attributes.[14] It will suffice to point out that such corporate virtues may well look for their reward in the rate of return, but certainly their capitalization and inclusion in the rate base of a utility ignores completely the economic bases of public utility regulation and valuation for rate-making. Clearly this is a confusion of value in the market sense applicable in private businesses, with the "value" upon which a public business is constitutionally entitled to earn a fair return.

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[12] *Re Bluefield Water Works and Improvement Company*, P.U.R. 1921-E 655, 663 (West Virginia Public Service Commission). This decision was later reversed by the U.S. Sup. Ct. 262 U.S. 679 (1923), but the going value allowance was not in controversy.

[13] P.U.R. 1920-D 83, III.

Going Value as a Differential. In many cases going value, even though it may not be allowed as a separate and distinct amount, is nevertheless used as a differential between two varieties of "value." This differential may be either of two types: First, it may represent the difference between the market or sales value of a public utility and its appraised value as a successfully operating physical entity; second, it may represent the difference between this same appraised value of the successfully operating physical entity and an amount which is the sum of the appraised values of the various distinct and separable items of physical property.

On first thought this classification of the meanings of going value may be considered redundant, for the meanings which have thus far been discussed might well be considered as differential amounts. The difference between the market or sales value of a utility and its appraised value as a successfully operating physical entity may in fact result from or represent good-will, or other intangible elements, such as those already pointed out, which ordinarily are reflected in market or sales value.

However, it has seemed best to group these various elements separately, while recognizing the apparent duplication of meanings which may result. . . .

a. *Differential between market or sales value and the appraised value of a successfully operating physical entity.* Many of the previous illustrations introduced conceptions of going value in which the market idea of value as applied to private businesses was undoubtedly involved. The confusion between market value, which ordinarily is the resultant of actual or potential earning power, and ''value'' as a basis upon which to compute the necessary fair return, has been almost universally condemned whenever it has been recognized.[15] As a result, most going value allowances, which *in fact* involve the market value fallacy, do so unconsciously and not deliberately.[16] . . .

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[14] Certain writers have advanced this point of view, for example: "Going value is too complex to be measured by any one element. It depends not only upon the excess of the return over legal interest on invested capital but also upon other elements, including the price at which the utility is able to render the service, the efficiency with which the utility functions and the nature of the relation which exists between it and the public which it serves. ". . . and going concern value, whether it consists in the power to earn a large income on the same unit price or to earn the same income on a lower unit price, results usually from sound business judgment and intelligent management, both of which are entitled to a proper reward." W. H. Maltbie, *Public Utility Valuation* (New York: McGraw-Hill Book Company, 1924), pp. 87-88.

b. *Differential between the appraised value of the physical items of property and the total value of the property as a successfully operating entity.* This construction of the going value concept is more tangible and capable of analysis than those which have thus far been discussed, although much confusion has nevertheless become attached to it. Going value, as the differential between the sum of appraised values of the physical items of property and the total value of the successfully operating entity, does not involve any separate or distinct allowance for going value as a separate measurable item. In essence, it means simply that the physical property of a utility is evaluated or appraised on the basis of its being a successfully operating unit, rather than merely a collection of physical items, to each of which a dismantling, or ''separated'' value might otherwise be attached.

The leading court decision supporting this interpretation of going value is Des Moines Gas Company *v.* City of Des Moines[17] where the special master of the lower court submitted his physical valuation, saying:[18] ''The physical value as hereinbefore determined is reckoned upon the fact that the plant was in 'successful operation' when the ordinance was enacted, otherwise its value would be much less. The 'going value' (which he excluded from his final valuation) is that enhancement which results from a well-developed paying business.''

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[15] For a leading judicial exposé of the fallacy of market value in public utility rate-making, see *supra* n. 11.

[16] That such clear applications of the market value concept do occur is well illustrated by the following statement of the New Jersey Supreme Court. *Public Service Gas Case*, 84, N.J.L. 463, 477 (1913). "We think that if by value we mean what the economists call exchange value, then a buyer would undoubtedly give more for a plant already doing a profitable business than for a plant of equal cost, capacity and future possibilities but without the published business. To a purchaser, the assurance of an immediate return is worth paying for." See Smith and Dowling, "Cases on Public Utilities" (St. Paul: West Publishing Company, 1926) note by R. L. Hale, p. 997, in which he makes similar conclusions after quoting from the decision of the Illinois Supreme Court in *City of Springfield* v. *Springfield Gas & Electric Company*, *supra*, where the court said of going value: "This element of value is always present in every assembled and established plant doing business and earning money. It is a property right and must be considered by the commission in determining the value of the property upon which the utility has a right to make a fair return. . . ."

[17] 238 U.S. 165 (1915).

[18] 238 U.S. at 170, where the report of the master to the lower court is quoted.

Upon appeal to the United States Supreme Court the court declared in favor of the master saying: ''When, as here, a long-established and successful plant of this character is valued for rate-making purposes, and the value of the property fixed as the master certifies upon the basis of a plant in successful operation, and *overhead charges have been allowed for the items and in the sum already stated,* it cannot be said, in view of the facts of the case, that the element of going value has not been given the consideration it deserves and the appellant's contention in this behalf is not sustained.'' (*Italics ours.*) Clearly, this means the court considered that a sufficient sum had been allowed by the master, when he had appraised the items of physical property and had added thereto the overheads and organization intangibles, but excluded an additional and separate allowance of $300,000.

In line with this opinion, commissions have recognized going value as a factor influential in arriving at the final ''fair value,'' without attempting to make a separate allowance for this item, or to define or explain just how much weight has been accorded in the final valuation. In this way, great latitude of administrative discretion is gained which otherwise would be lost to the courts through their exercise of judicial review. The Interstate Commerce Commission is following this interpretation of the going value question in its valuation of the railroads, despite the storm of protest that has been raised by the carriers.

In the Bangor and Aroostook case[19] the commission said in regard to the carrier's claim for going-concern value:

> When we come to a consideration of final value we view and value the property as that of a common carrier fully organized and operating and with business attached. In the instant case the values assigned to the property are not those of a dead plant, but of a going concern. In making up the inventory we apply prices to the different parts of the property in the light of the fact that it is a railroad and doing business; otherwise the prices applied would be scrap prices. Our methods are similar to those adopted in the case of Des Moines Gas Company *v.* City of Des Moines.

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[19] *Bangor & Aroostook Railroad Company et al.,* 97 I.C.C. 153, at 166-7 (1925).

> Again in the Elgin case[20] the Commission says: "We have not only valued these properties as a going concern, but in our estimate of the cost of reproduction now we have included organization expenses, the expenses of general officers and clerks, law expenses, expenses of stationery and printing, taxes and other general expenditures, and interest during construction. We have included working capital. We do not find that there are any other values or elements of value that pertain to the property of these carriers to which we can assign a money value.[21]

The above illustrations[22] are adequate to establish the nature and rather widespread existence of an interpretation of going value as a differential between the value of the physical parts of a property and its total value as an operating unit. This construction makes going value a non-separable element of rate-base value, which is practically identical with allowances for the various classes of overhead expenses.

Going Value as Losses Necessarily Incurred or Income Foregone. The idea of treating going value as necessary losses and income foregone was first advanced by the Wisconsin Railroad Commission. It was formulated in what is known as the "Wisconsin Method" of treating going value.

The Wisconsin Method, as applied in the well-known case of Hill *v.* Antigo Water Company,[23] was based upon the theory that the costs of establishing a successful business, as evidenced by the income or fair return not received during the "developmental period" of the business, were essentially as much a part of the investment as the direct outlays incurred in the acquisition of land, buildings and other physical property. The reason for this attitude seems to have been the belief that businesses operating in a carefully regulated market could not offer sufficient inducement for an adequate flow of new capital at low cost unless they were allowed, within certain limits, the same privilege of making up pioneering losses which private business has. Although Wisconsin has followed the policy of capitalizing necessary early losses, it has recognized the possibility of amortizing rather than capitalizing such costs. Furthermore, the amount added to the rate base by this method has not been allowed to include losses due to careless and unprogressive management or to utility construction far in advance of the needs of the community.[24] . . .

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[20] *Re Final Valuation of Elgin, Joliet & Eastern Ry. Company*, 84 I.C.C. 587, 617 (1924).

[21] See also *San Pedro, Los Angeles & Salt Lake Railway Company*, 75 I.C.C. 463 (1923); *Texas Midland Railroad*, 75 I.C.C. 7 (1918). Nearly all the valuation decisions of the Interstate Commerce Commission, both tentative and final, contain similar statements.

[22] See also *Re Helena Light & R. Company*, P.U.R. 1920-D 668; *Cincinnati & Suburban Telephone Company* v. *P.U.C. of Ohio*, 113 O.S. 259, 295 (1925) for similar analyses.

[23] 3 W.R.C.R. 623 (1909).

Likewise, the Wisconsin Method appears to have included a determination of the extent to which the early deficits of the developmental period of the business were recouped by the utility in subsequent earnings. As described in City of Green Bay *v.* Green Bay Water Company,[25] "the method which has been followed by the commission aims to determine as far as possible what the actual cost of developing the business in question has been, and to what extent, if at all, such losses have been recovered in later years of operation." [26]

The "deficits method" has frequently been limited to only the necessary deficits below a fair return on the investment of the *present* owners. This point of view is expressed in a decision of the New York Supreme Court.[27] "In determining whether the plaintiff is to be entitled to a "going value," it must be borne in mind that in 1901 it took over an established and going concern and did not start the water business, but continued, extended, and expanded an already established enterprise; and in the absence of proof to the contrary, it must be assumed that its income was sufficient to pay a fair return upon its actual investment, and the burden of proving otherwise rests upon the plaintiff. . . ."

As originally developed, the Wisconsin deficits theory was employed with the investment standard of valuation. By other regulatory authorities it has been applied in conjunction with other standards of valuation, as we shall see subsequently.

The Wisconsin Method since its inception has had widespread influence upon the decisions of both courts and commissions. In recent years it has indeed been more actively used in other jurisdictions than in that of its origin. It also has been criticized from a number of standpoints. For example, the charge has been made that the Wisconsin Method guarantees a fair return to a utility; that extravagant and poor management are encouraged by the deficits principle; that a consistent application of the method results in the ''ridiculous circumstance'' of a bankrupt utility possessing a larger ''value'' than a successful and profitable concern.

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[24] *Oconto City Water Supply Company*, 7 W.R.C.R. 497 (1911); *State Journal Printing Company* v. *Madison Gas and Electric Company*, 4 W.R.C.R. 501, 585, 586 (1910); *City of Beloit* v. *Beloit Water, Gas and Electric Company*, 7 W.R.C.R. 187, 277 (1911).

[25] 11 W.R.C.R. 236 (1913).

[26] See also: In *Re Rates and Rural Service of Monroe County Telephone Company*, 18 W.R.C.R. 890 (1917). For an important decision upholding the Wisconsin Method, see *Kings County Lighting Company* v. *Wilcox*, 210 N.Y. 479 (1914).

[27] *N. Y. Interurban Water Company* v. *Mount Vernon*, P.U.R. 1920-D 515, 521. A similar idea is intimated in *Galveston Electric Company* v. *City of Galveston*, 258 U.S. 388 (1922), in which the Court remarks in a note, at page 395, "if what is to be considered in determining the net deficit is not the result of operations since the present owner acquired, in other words, the return on its investment, we are left without the data necessary to determine the fact." See also *State Journal Printing Company* v. *Madison Gas and Electric Company* and *City of Beloit* v. *Beloit Water, Gas and Electric Company*, *supra* n. 24.

A more substantial criticism is offered by those who argue that losses or deficits, even granting their necessity, do not represent investments and should not be included in the rate base. Proponents of this view ordinarily admit, however, that necessary deficits or losses should be compensated, but urge that the compensation should be made by allowing a rate of return sufficiently liberal to amortize any proper amounts of this character,[28] or ''sufficiently high to attract them (the investors) into the field under the particular conditions involved, among which is the possibility of little or no return during the first few years.''[29]

In summary, it appears that of the various uses of the term ''going value''—as good-will; as merely an intangible attribute of a utility organized, with business and customers attached, and in profitable operation; as a differential between the original or reproduction cost of a successfully operating utility and its market or exchange value; as a differential between the original or reproduction cost of a successfully operating entity and the value of its separate physical parts; or as an amount representing the necessary deficits below a fair return—only the last two have logical significance. And of these two, that which construes going value as being simply the difference between the appraised value of the separable units of property and total fair value computed on the basis of original or reproduction cost presents no problem. In reality it amounts to little more than saying that all necessary overheads should be added to the appraised value of the various physical items constituting a utility plant, and that the properties should be valued as a successfully operating unit, rather than as merely a collection of physical units to which a dismantling or ''junk'' value might be attached. This use of the term is best illustrated by the Des Moines case and by the valuation decisions of the Interstate Commerce Commission.

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[28] See *Queens Borough Gas & Electric Company*, 2 P.S.C. 1st D., N.Y., 544, 568-569 (1911). In this case the former New York First District Commission applied a policy of amortizing these losses or deficits rather than adding them to the rate base.

[29] See B. W. Lewis, "Going Value—Comments on its Nature and Legal Status," *American Economic Review*, XVII (December, 1927), 657-668.

Concerning the validity of this construction of going value there can be no dispute. Unfortunately, however, the concept of going value is confused by the obscure language used in discussing it. Undoubtedly, the lack of clarity or frankness sometimes found in the decisions of the Interstate Commerce Commission and other bodies may be traced, in part at least, to the uncertain position of the courts on this point, and the desire of the commissions to build a useful camouflage against the frequently destructive and discouraging results of judicial review.

Going value in the sense of necessary losses and deficits below a fair return, therefore, remains the one use of the term which is constructive in nature. Going value as ascertained by the Wisconsin Method, or by variations of this method, constitutes a definite and significant addition to the theory of rate-making valuations, *provided only that* its fundamental premises are accepted as valid.

It is believed that the economic significance of this type of going value has been much obscured by the failure to discuss the problem with reference to the several theories or standards of valuation. Although the so-called net deficits theory originated in close association with the investment standard of valuation, its use outside of Wisconsin often in connection with other standards of valuation has resulted in a serious confusion of premises, and in many illogical applications.[30] Consequently, the validity of the Wisconsin method may be considered profitably from the standpoint of the investment basis of valuation, the cost of reproducing the service, and finally, from the historical or actual cost basis of valuation.

[30] In addition, the economic validity of the entire going value concept has been challenged by recent writers. (See particularly H. B. Vanderblue, *Railroad Valuation* (Boston: Houghton Mifflin Company, 1917), pp. 166-177; B. W. Lewis, "Going Value—Comments on Its Nature and Legal Status," *op. cit.*). The principal points of criticism relate to the practical difficulties inherent in the application of going value in this sense, and to the alleged economic fallacy of considering the necessary deficits below a fair return as a portion of the investment or sacrifice upon which a utility should be allowed to earn a fair return.

CHAPTER XI

MAINTAINING THE PLANT AND THE INVESTMENT

121. Depreciation *

Valuation figures may be greatly altered by the treatment accorded depreciation facts. The two broad divisions into which the general subject of depreciation in public utility properties may be divided are (a) physical and (b) functional depreciation. These types of depreciation are wholly different in their nature, and must be treated differently in rate-making. Physical, or theoretical, depreciation exists when a given period of the service life of a plant has elapsed. Assuming that the entire period of the service is ten years, after the lapse of five years theoretical depreciation to the extent of 50 per cent of the value of the plant would exist. Nevertheless, and provided the plant has been well maintained in the interval, there would be no loss in efficiency or service value. On account of this fact depreciation in this sense has sometimes been called decretion because of the gradual physical deterioration.[1]

Functional depreciation may be distinguished from theoretical depreciation by the fact that equipment in whole or in part may be superseded by more efficient inventions reducing the cost of service or giving better service at the same or a different cost. In this event depreciation is due to obsolescence. Functional depreciation may also take place because the growth of a community renders the old plant and equipment inadequate to take care of the increased needs. It may also take place on account of regulatory or legal requirements which the existing plant cannot meet. In each of these cases the plant may still possess undiminished service value.

Theoretical Depreciation. There has been much confusion on the subject of theoretical, or physical, depreciation. Neither the courts nor the engineers have been in agreement even among themselves on this question. Yet theoretical depreciation as just explained must be distinguished from loss of service value. A plant loses service value when the management has failed to make proper repairs and replacements, thereby reducing its ability to give standard service. Where courts and commissions have clearly made this distinction they have claimed the right to reduce valuation figures by the amount necessary to place the plant in standard service condition. At the same time they have refused to reduce valuations on account of theoretical depreciation.[2] In a recent case a federal court said,[3] "The mere elapse of time since the plant was established or its units have been installed has not been shown to have decreased the value of the property as a whole as it stands today." In this case nothing was deducted for theoretical depreciation. Some form of penalty for failure to maintain property in first-class condition is doubtless desirable. Yet this form of penalty does not meet the situation, for property in a run-down condition will require increased operating expenses out of all proportion to the expenditures necessary to restore it to standard condition. The most effective remedy here is not to penalize the security holders, as this method of treatment does, but to require that property be maintained in standard service condition at all times.

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* Excerpt from John E. Kirshman, "The Principle of Competitive Cost in Public Utility Regulation," *Yale Law Journal*, XXXV (May, 1926), 815-818.

[1] H. E. Riggs, *Depreciation of Public Utility Properties* (New York: McGraw-Hill Book Co., Inc., 1922), Chap. XI.

There has also been much disagreement as to the treatment of purely theoretical depreciation where the plant has been maintained in the best condition. Neglecting former practices in this matter, it may be said that regulatory bodies now distinguish between cases where a reserve is carried and those where no reserve is carried. The former method is called the allowance method, while the latter is referred to as the replacement method. Where the reserve method is used, deductions are made annually from operating revenues sufficient to amortize the cost of the equipment or part at the end of its service life. Where the reserve is reinvested in the plant in the form of extensions or betterments, courts and commissions now quite generally make no deductions from valuation figures to take care of depreciation.[4] But where it is otherwise invested, the amount of the depreciation fund may properly be deducted from the valuation to find the rate base. Where the replacement method is used no reserve for theoretical depreciation is carried, but only an amount sufficient to replace parts or units of equipment as it becomes necessary to keep the plant in standard service condition. The plant is thus regarded as a continuing unit with an indefinite life period; and as long as it remains up to standard condition no loss in service value results.

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[2] See *New York and Queen Gas Company* v. *Newton* (1920, S.D. N.Y. 269 Fed. 277.

[3] *New York and Richmond Gas Co.* v. *Prendergast*, P.U.R. 1926-B 759; *Re J. H. Perry*, P.U.R. 1925-E 161.

[4] *Michigan Public Utility Commission* v. *Michigan State Telephone Co.* P.U.R. 1925-C 158; *Monroe Gas Light and Fuel Co.* v. *Michigan Public Utility Commission*, P.U.R. 1923-E 661; Cf. *Cincinnati* v. *Public Utility Commission*, P.U.R. 1925-E, 432.

It does not seem that either of these methods of treatment would necessarily work injustice to the security holders, for the rate base would remain the same as the original or prudent cost of the plant. Injury would come, however, where the regulatory body confuses these methods so that while attempting to apply the replacement method deduction is also made for the comparatively small reserve carried. In the replacement method the fund must of necessity be kept in liquid form so that it will be available at all times for the purpose for which it is intended. While some deduction may justly be made in view of this as an earning fund, deduction beyond this amount would result in an inadequate rate base.

It should also be observed that in case of the allowance method of treating depreciation, where the fund is invested in extensions the public profits by receiving the services of a larger amount of property than that represented by the rate base. Theoretically it is sounder than the replacement method on the further ground that it requires the current users of service to pay all legitimate operating expenses. The present tendency of the courts away from the allowance method of treating depreciation cannot be looked upon with entire approval.[5]

Functional Depreciation. Functional depreciation must be treated in a different manner. It should first be observed that in competitive industry functional depreciation occurs when old equipment becomes either obsolescent or inadequate on account of newer inventions and processes which place their users at an advantage over competitors who continue to use the older equipment. Competition will of course finally force the abandonment of older equipment. Since competition is normally absent in public utilities there is no functional depreciation here in this sense. There is, however, a form of competition among the users of the service, a sort of social competition which leads the public of any given community to demand service equal to or better than that of other communities. Old service units may for this reason have to be abandoned in favor of the newer and better units. But this can hardly be called depreciation. New service units replaced for this reason should legitimately be charged to the rate payers who get the benefit of the better service. The charge should be sufficient to provide interest on the additional capital installed and an annual charge on operating expenses to provide an amortization fund for the discarded equipment. The principle of charging the costs of better service to those who benefit from such service has special application where it is required on account of regulatory measures.

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[5] Cf. M. L. Cooke, *Public Utility Regulation* (New York: Ronald Press, 1924), for Chapter by Donald R. Richberg, "Major Problems Presented to State Commission," pp. 66-67.

Machinery and equipment superseded by units more efficient from the point of view of cost in producing service may profitably replace the older units when the saving in operating expenses is sufficient to pay interest on the additional cost of the newer machinery and to provide an amortization fund for the balance of the service period of the older machinery and equipment. This is the only sound economic basis for discarding machinery which operates only at a high cost. In case of replacement on account of sheer inadequacy of the older plant to perform the service required by a growing community, it is no more than just that the future users of the service should stand the additional costs of enlarging the facilities.

In all cases of functional depreciation it will be observed that it is only the future and never the past which is affected. In every case the burden ought to rest upon the future rate payers. It appears, therefore, that a reserve for functional depreciation would be out of place prior to the discarding of the obsolete or inadequate machinery and equipment.

The treatment of depreciation on account of obsolescence and inadequacy by engineers has been diverse in character and very unsatisfactory in its results. To quote Professor Riggs:[6] ''One will discard it entirely, another will consider it and possibly modify his figures slightly on account of the previously obsolete character of certain units of property, while a third will make heavy deductions in arriving at fair value.'' The courts have dealt only sparingly with this type of depreciation, but have in a few instances refused to allow deduction therefore.[7]

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[6] *Supra* Chap. XI, 132.

[7] See *Kansas City Southern Railway Company* v. *United States* (1913), 231 U.S. 423; also Special Master Gilbert's report in *New York & Queens Gas Company* v. *Newton* (1920, S.D.N.Y.), 269 Fed. 277.

122. Depreciation In Relation to the Investment *

Of the fact of depreciation there is no doubt. The relation this fact bears to investment is not so clear. The question is, and it is obviously one of large import, does cost-new or cost-minus-depreciation represent investment.

The answer to this question depends (1) on the point of view in defining the relation of depreciation to investment; (2) on the nature of the business, whether or not there is a normal depreciated condition; (3) on the expediency of accumulating depreciation funds where normal depreciation exists; and (4) on whether or not the utility is regulated for the first time.

Depreciation is ordinarily defined as decline in productive power and depreciation fund as the amount necessary to keep the investment intact. The value of a production good depends on the estimated value of the final goods it can turn out during its lifetime. Since the capital good normally wears out and must be replaced, a fund for replacement must be created to keep intact the original investment. Depreciation is thus a cost of production which price must cover. For instance, a particular class of capital goods may have an average life of ten years and be capable of turning out goods with a net value of $1,000 annually. The value of the capital good would be something like $20,000 if the interest rate is 5 per cent. The gross income would have to be something like $3,000 annually, for approximately $2,000 a year for ten years would be required to replace the machine at the end of its life. After five years of service, the machine would be worth only $10,000 for it has only five years of productive life left. Its productive power, in other words, is decreased by one-half. Meanwhile a fund of $10,000 would have been created and the investment would be intact.

Another formulation of the same doctrine may be made in terms of productive efficiency. Undoubtedly, if renewals are made promptly, productive efficiency remains constant after a condition of normal depreciation is reached. But if we consider the plant as new and then in a state of normal depreciation, we discover a decline in productive efficiency, for productive efficiency, significantly enough, is interpreted to relate to cost per unit output. It is well known that in the earlier years operating costs are

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* Excerpt, H. B. Whaling, *Fair Value—Economic and Legal Principles* (Bulletin of the University of Wisconsin, No. 923, 1915), Chap. III, pp. 57-69; (Economics and Political Sciences Series, Vol. IX, No. 3), pp. 429-441.

less than after the normal depreciated condition is reached. If capital is amortized or if additions and betterments are made from a fund accumulated during these years, and no return is allowed on these improvements; while operating costs are increasing, fixed charges are diminishing, and the total costs per unit output may remain constant. In this sense productive efficiency may be said not to decline.

In this view, of course, cost-new less depreciation would be the criterion of investment. It matters not what disposition was made of the fund. It may have been paid out as dividends which would amount to dividend payments out of capital, or it may have been put back into the business, in which case cost-new less depreciation would tend to equal original investment, or it may be held as a fund which may be invested in outside securities or what not. The original investment has not been invaded in valuation. It seems all very simple that if property is half worn out, as it would be at the end of five years in the illustration we have been using, it represents only half the original investment. But is it so simple after all?

Clearly, the whole reasoning is from a market value point of view. Of course, no one would give as much for ten machines half worn out as for ten new ones. If one grants the point of view, and if a depreciation fund must be created to keep investment intact, the conclusions seem inevitable. But we are not seeking market value; we are looking for fair value. It may be that the two are the same, but this is, by no means, a necessary fact.

This leads us to discuss the nature of a business with normal average depreciation. In a business so large, and with such varied capital items bought at different times as the railway business, there are always some items about new and some items about ready for scrapping. That is, the railway business is always about half worn out. More accurately, if we take into account salvage value and dynamic conditions, the normal average depreciation may be said to be about 40 per cent.[1]

If we follow out the productive power theory we would have, assuming the same ten machines for purposes of illustration,[2] a fund accumulated composed of the following amounts: $20,000 for the machine ready for scrapping, $18,000 for the machine ready for scrapping next year, etc., down to $2,000 for the machine in use for one year plus $20,000 accumulating during the year, or $10,000 for the whole year. The formula N (N/2) (average annual depreciation per machine) gives the same result. Applying the formula, or adding up the amounts, we have, after five years, a fund of $100,000, or half the original cost. The figures, for simplicity's sake, disregard dynamic conditions and salvage value. Now it is perfectly obvious that under conditions of average normal depreciation an annual fund of $20,000, without the accumulated fund of $100,000, would easily maintain the efficiency of the ten machines. This fact has led some to deny the usefulness of an accumulated fund.[3]

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[1] The determination of the approximate percentage normal depreciation is an engineering problem. We may assume 40 per cent for purposes of discussing the economic results of an average normal depreciation.

[2] *Supra*, p. 596.

Those who hold that the accumulation of a depreciation fund is unnecessary in the case of a business with an average normal depreciation must hold that there is no relation between mere aging, or even physical wear and tear, and the diminution of investment. Although from the productive power point of view the machines may be half worn out, the original investment may be intact. "When capital goods are installed their cost is a definite amount of investment; when they are retired from use the investment is diminished by the amount of their cost minus salvage. If the capital goods are replaced promptly when retired, is not the amount of the investment in every real sense kept intact?"[4]

In the illustration we have been using, this view would require only $20,000 annually and not the additional fund of $100,000.

All would grant immediately that the fund must be considered, and cost-new less depreciation be used to represent investment, if legally the fund was required. Two questions arise: first, is it economically expedient to require the fund; and second, in the case of newly regulated companies, is it just to assume that the fund has been or ought to have been created?

We take up the case of newly regulated companies first. Is fair value attained by using cost-new less depreciation to represent investment? To use this basis is to assume that the productive power theory ought to have been in operation in the past. Certainly depreciation has taken place. Equally certain is it that depreciation is an operating cost. But no reason appears for assuming that a particular theory, however strongly one may think it suitable for the future, has been operative in the days of non-regulation. Whether or not depreciation ought to be deducted seems to depend on the facts in the case. If it has been customary in the past for businesses to accumulate such a fund which has been used for amortization or for extensions, it is probable that depreciation ought to be deducted. On the other hand, if it has not been customary to do this thing, and if no fund has been accumulated, there seems to be no good reason for deducting depreciation. It would seem that to do so would be to penalize business for the mistakes of government or the public. The question is one of fact.

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[3] A. A. Young, Depreciation, *Quarterly Journal of Economics*, XXVIII (May, 1914), 630. See controversy between Young and Davis concerning the depreciation problem in *Quarterly Journal of Economics*, XXIX (February, 1915), 369.

[4] A. A. Young, "Depreciation," *Quarterly Journal of Economics*, XXVIII (May, 1914), 634.

Theory, however, may throw some light on the situation. As a matter of pure theory, it seems probable that under competition, in permanent businesses where there is a normal average depreciation, potential competition would eliminate the accumulation of such a fund, for lowest expense levels would obtain. In the case of monopolistic businesses, theoretically, earning power would not be dissipated if the fund was never created. The theoretic fund might well have been paid out as dividends without in the least affecting earning capacity. It would not, therefore, amount to payment of dividends out of capital.

The question then becomes: What were the conditions of investment? Those who hold the productive power theory would maintain that the lower operating costs and the assumed higher profits during the earlier years, in reality, amount to a repayment of investment. This, however, is not clear. It may be that these lower operating costs were a part of the total situation inducing investment of capital in the business. One cannot assume with certainty that operating costs should have been charged with any fund beyond that necessary to maintain properly the plant through repairs and renewals. It seems very likely, and it is backed up by a theoretical position, that current business policy did not require the accumulation of any such fund. In this view, original investment comes to be the criterion of fair value, and the productive power theory, with its deduction of depreciation, is cast aside.[5]

It may be, of course, that once a company is regulated, it is expedient to require the accumulation of a fund and to pass over to the productive power theory. This is one question. What has been in the past is quite another. The presumption is strongly against deducting depreciation in the case of newly regulated companies. In what seems to us sound, Mr. Allison says:

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[5] Prof. A. A. Young says: "It seems very probable, and properly so, that business policy was not framed to the marketability of capital assets. We cannot assume that where realized depreciation is easily and normally met out of operating expenses, and where unrealized depreciation in market value has not been charged to operating expenses, nevertheless, such unrealized depreciation is a virtual operating expense." "Depreciation," *Quarterly Journal of Economics*, XXIX (February, 1915), 383.

> In the case of an heretofore unregulated company it cannot be shown that the company ought to have set aside depreciation charges to accumulate a fund equal to theoretical depreciation for such a fund would be useless. The conclusion seems clear, then, that in all ordinary cases of heretofore unregulated properties we cannot justly depreciate to obtain fair value unless we admit the justice of ex post facto laws or equivalent regulation or unless we interpret fair value to mean market value and not just amount.[6]

In the event that depreciation has been allowed to go to the point of falling below normal, it seems, logically enough, that such depreciation should be deducted for this is an evident instance of payment of dividends out of capital or of unfortunate investment, in either of which cases the investor should stand the loss.

It will naturally be argued by the productive power theorist that, although it may have been done innocently enough, profits have been overstated, dividends have in reality been paid out of capital, stated surplus is in part spurious.[7]

However, it is believed that Professor Young is right when he says:

> In general, there is a reasonable presumption that the investment in the undertakings which have not accumulated a depreciation reserve were not made with the expectation that it would be necessary to charge accruals to operating expenses. It follows that it cannot in general be presumed that the profits of such undertakings have contained an element which should unquestionably be considered repayment of part of the invested principal. Accordingly, serious objection might properly be made to a system of accounts which requires that property already on hand be written down for depreciation.[8]

The next consideration is the question of the expediency of requiring a fund under regulation. It may be well to announce the policy of requiring the creation of a depreciation fund in cases of companies under regulation. The validity of the policy hinges on the effect of the fund on the level of expense. If, returning to the same illustration, the $100,000 fund is accumulated, either one of two things may happen. First, the fund may be used to amortize depreciation, and investment will decline to $100,000. The public has paid a lump sum into the company which is to be regarded as a sort of public investment, in other words, it has purchased an annuity. Second, the fund may be used for extensions, etc., in which case the company investment stands at $200,000 instead of $300,000, to which sum the investment would have been raised had the company made the additions from new capital. Again the public has bought an annuity. If the rate of return allowed the company is approximately equal to competitive rates of return, it is obvious that the level of expenses would be unaffected. If, however, the rate of return allowed the regulated concern is larger than the competitive rate, it is clear that the result is a lowering of expense levels. The opposite theorem is valid. Under the theory of fair value here presented, rates of return under regulated monopoly and competition would be the same, and the level of expenses would, in the long run, be unaffected.

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[6] Mr. Allison's position is found in Appendix A to the Report of the St. Louis Public Service Commission on the United Railways of St. Louis, p. 99.

[7] Mr. Davis takes this position in the controversy between Mr. Young and himself in *Quarterly Journal of Economics*, XXIX (February, 1915), 395.

[8] A. A. Young, "Depreciation," *Quarterly Journal of Economics*, XXIX (February, 1915), 369.

However, the distribution of expenses presents a difficulty. Obviously, the consumers during the period in which the fund was being accumulated would be, in part, paying future expenses. To what extent the present should thus endow the future is a delicate problem. In general, it is believed that each generation should pay the costs of the services it enjoys. From this point of view, then, one might well be justified in denying the expediency of creating depreciation funds under conditions of normal depreciation.

From this point of view, however, a distinction must be drawn between new companies and old ones with established credit. Businesses seldom spring complete into existence. If successful there is more or less rapid extension. It may be well under these conditions, before credit is well established, to require some sort of a fund, although it need bear no particular relation to theoretical depreciation. This is a case where necessary returns would be higher than under conditions of established credit and therefore the tendency would be to lower general expense levels. This having been done the company would soon reach the state of normal depreciation and would be in the same position as old companies. This fund is not a depreciation fund in the sense that the productive power theory interprets that concept. It is a fund used to meet certain conditions prevalent in the early stages of a business. In fact, it is similar to the fund we believed ought to be allowed to cover up fluctuating receipts.[9]

Functional Depreciation may be defined as lack of adaptation to function. This sort of depreciation may be due to dynamic conditions which render a plant inadequate or to improvements which render it obsolete. Inadequacy ordinarily may be foreseen whereas obsolescence usually cannot. Consequently, it exists as a risk of the business. Risk involves expense and this expense must ultimately be paid by the consumer.

A very great difference, however, exists between obsolescence in competitive businesses and in regulated monopoly businesses. If, under actual competition, although this would not be true under perfect competition, an improvement renders a capital good obsolete, the producer is forced to replace the item. This is not the case under regulated monopoly. Unless the saving in operating costs is as great as the increase in capital charges due to the installation of the new machine, the old machine may be continued in use. In this view a capital good becomes obsolete only when its retention would maintain a higher expense level than would obtain with the introduction of a new capital good in its place. Unforeseen improvements need, therefore, present no difficulty. And since capital goods wear out rather rapidly, the substitution can take place without much delay.

Thus, although it seems impossible that obsolescence ''mortality tables'' can ever be constructed, regulation affords insurance against fortuitous changes. The premium would be represented by the temporarily higher expense level due to retaining the old capital good. This sort of insurance has the same economic validity as all other insurance; a permanent lowering of expense levels through the elimination of risk.

This theory of obsolescence applies to a class of items usually treated under the head of discarded property. Usually in any large public utility that has been operating for any length of time there are certain items that have been discarded. For instance, a certain station site may have been abandoned. This will probably be held until it can be sold at an advantageous price. Such an item is really an obsolete item from the point of view of the public utility and must be excluded from value. Certain portions of the plant may have been discarded, but may be held for emergency purposes. If the emergency is a real one, such an item is a part of the cost of the service to the public, and it must be included in value. It is sometimes argued that it should be included at its emergency value.[10] In the case of a lot used for storage purposes, if a cheaper lot would do as well, it is probable that the value of the lot should be placed at the lower figure. For, reasonably enough, it may be assumed that the company will not discard items having left in them any appreciable degree of earning capacity. Under the theory of obsolescence outlined above when an item is discarded it is scrapped. Meanwhile, all renewals and repairs have been properly cared for. In order to keep the item in the business as a possible emergency item, it is necessary only to allow its scrap value.

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[9] See Whaling on "Surplus," *Fair Value*, p. 49, *et seq.*

Two facts tend to simplify the inadequacy problem in the case of railways: first, the size of the business and the variety of capital goods; and second, the relatively small units of capital goods.

The first fact results in what may be called partial inadequacy. For instance, it may become necessary to replace light with heavy rails, or less powerful with more powerful locomotives, but the replaced items are useful on divisions of lighter traffic or for sidings, switches, etc. Thus, although inadequate for one purpose, such items are entirely adequate for other purposes. Most items of capital in the railway business are of this character. Since, on account of size, replacements are being constantly made anyway, the problem of inadequacy does not assume a very serious aspect. This sort of inadequacy may be met easily from operating expenses, although the difference in cost between the new instrument and the old one should be charged to capital expenditure, for by so much it represents new investment. If this is not done no return should be allowed on the difference for it assumes the nature of a public investment. On the same grounds as before indicated, the distribution of costs requires that it be accounted a capital expenditure.

The second fact relates to saturation. Since inadequacy of this sort is overcome by additions of capital goods of the same sorts, there is no necessary scrapping. In the case of a gas company, for instance, the substitution of four-inch mains for three-inch mains requires the scrapping of the three-inch mains, for there is ordinarily no present use for them. But not so with the railway business. The addition of ten freight cars does not require the scrapping of anything. The fact of relatively small capital units thus greatly simplifies the inadequacy problem. Of course, such expenditures are charged to capital.

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[10] Whitten, *Valuation of Public Service Corporations*, p. 190.

Some items of railway property do not fall under this position. If it becomes clear that a large station must be replaced in a short time on account of inadequacy, it must be provided for by the accumulation of a fund of sufficient size to finance the deal.

Some theorists have carried the functional depreciation idea to an extreme length in the notion of hypothetical functional depreciation. It is argued that particular items of capital lose in value each year because of the reasonable certainty that they will be superseded before the end of useful life. In the first place, such hypothetical depreciation does not represent any investment. In the second place, under the theory of obsolescence here suggested such replacements would be guarded against. And in the third place, even if one agrees with the general point of view, it is only when the actual supersession takes place that the old item is really depreciated.[11]

Obsolescence often results from consolidation. The argument is advanced that a return should be allowed on the total investment in the constituent plants. This contention rests evidently on the assumption that all physical construction costs are legitimate elements in value, and is normally true. But if investment is high because of clearly unnecessary expenditures the case is one of unwise expenditure and no return is allowed. This seems to be the logical position to take in the case of supersession due to consolidation.[12]

Accrued functional depreciation should be treated in valuation precisely as accrued physical depreciation. If the market value point of view is held, which we have indicated we cannot subscribe to, accrued depreciation would be deducted. But we hold that the fiscal history of the road should be appealed to and that investment should be determined as accurately as possible. If records are available it may be possible to show that functional depreciation should sometimes be deducted, but the presumption is strongly the other way. This may be irritating to the public, but it is just: the public fixed the rules of the game and it ought not to change them retroactively.

Abnormal Depreciation. A class of items that presents many uncertainties may be called abnormal depreciation. For instance, a flood may wash away bridges, tracks, etc. Where this occurs in a non-flood district and is entirely unexpected, the loss should be borne by the investor, probably through assessment, as it is necessarily borne by other investors in various lines of production; where, however, the risk may in part be foreseen it will ultimately be borne by the consumer. It is probably better to bear it directly through slightly higher rates which will accumulate a fund which may be put into the property and held as public investment. Should the damage actually come and the property be destroyed the public loses its investment. Meanwhile, by taking the risk from private investors the level of expenses has been lowered.

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[11] This point is discussed in Whitten, *Valuation of Public Service Corporations*, p. 381.

[12] *In re Application of the La Crosse Gas and Electric Co.*, 8 W.R.C.R., 138, 172.

Another possible way to treat such items turns on the question of responsibility. Since unforeseen losses of the sort mentioned are due to no fault of the investor, it is argued that the investor should not bear the loss. The service is socially necessary and the consumer should sustain the loss. This position has merits, but it is not in line with the doctrine of equal opportunity. Under competition, the investor would bear the loss in a case of this kind. Under regulated monopoly, equal opportunity is established, if likewise the investor suffers the loss. The risk is so intangible that it is hardly possible to estimate it and lower returns accordingly, which would be necessary under the responsibility test.

Non-Physical or Intangible Items. So far we have considered the costs of physical items. There are several categories of non-physical items that must be considered. These sorts of items may be grouped as (1) overheads, (2) going value, sometimes confused with going concern value, (3) bond discounts, and (4) risk.

Overheads include such outlays as expenditures for engineering and superintendence, promotion and organization, contractors' profits, legal advice, contingencies, and loss of interest during construction. That such expenditures are necessary is clear. In theory, no difficulty is presented in dealing with these items. Actual bona fide outlay represents the amount that should be allowed in value. In practice, where it is possible to discover the actual outlays the problem is simplified. And as regards the future, accounting systems can obtain these facts. As regards the past, however, it is not always possible to get the actual outlay. Here it is necessary to estimate overheads, which is usually done by the comparative method. And although conditions are never exactly alike, and therefore the method is only a rough one, it has been found that anywhere from 10 per cent to 12 per cent of the inventory or physical value is usually a fair amount to allow for overheads.[13]

On the theory that overheads vary with the value of the physical items, it is sometimes argued that they should be depreciated in like ratio to physical depreciation. In case cost-new less depreciation is adopted as the criterion of value this would be a logical corollary. In case cost-new is taken as the basis of fair value, obviously no depreciation of overheads would appear. It is the same problem that was met in the case of physical depreciation. As regards the future, the point will be discussed under the caption "capitalization *v.* amortization," and it will be urged that such items of expense should be capitalized.[14]

In regard to the past, just as we hold that physical depreciation which is not below normal should not be deducted, so must we hold that overheads must be allowed at full value in rate cases. It may be urged that surplus profits represent an amortization of these non-physical items, but for precisely the same reasons that we set forth in the case of physical depreciation we are forced to conclude that this would be an example of retroactive regulation of an unfair nature.[15] Since, if the physical plant should disappear there would be no source of income and non-physical items would be valueless, the position outlined can only hold to the point of normal depreciation. If depreciation has gone below the point of normal, investment has been invaded and overheads ought to be depreciated to the same extent. . . .

123. Evolution of Depreciation Accounting *

In the earliest days of public utility operations depreciation was an unknown and neglected factor. The pioneer public utility plants were crude and inefficient. With the rapid developments in engineering practices and business expansion these plants were soon replaced by larger, more reliable, and more efficient equipment. In most cases the new investment was fully capitalized, partly because the pioneer business had not yielded sufficient profits to permit the writing off of pioneer equipment but also because many executives of these utilities did not see any impropriety in crediting their property accounts with only the salvage value of the retired equipment. In so far as the equipment was small and its replacement could be taken care of in operating expenses without undue distortion, the upkeep of the property was given adequate accounting attention, but when the general system or major parts of it were abandoned and more modern facilities substituted, the accounting system, as already stated, failed to function adequately.

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[13] The Wisconsin Railroad Commission which has done more than any other in the matter of cost analysis and careful comparative studies allows this amount. See Whitten, *Valuation of Public Service Corporations*, Chap. 12.

[14] See Whaling, *Fair Value*, p. 83. [15] *Ibid.*, p. 57, *et seq.*

* L. R. Nash, *National Electric Light Association Bulletin*, October, 1923; reprinted *Stone and Webster Journal*, XXXIII (1923), 527-541.

The first important forward step in this phase of public utility accounting was the realization that customers should reimburse the utilities for the cost of facilities retired from service, whether the retirement was due to ordinary wear and decay or other causes. It became clear that property was used up in public service even if it did not wear out physically but, instead, was abandoned because of obsolescence, inadequacy, or other economic forces in the interest of the consuming public, and that the full investment therein should be ultimately retired or transferred to substitute property not otherwise capitalized. Such being the case, public utilities, at least the prosperous ones, began to accumulate reserves to take care of future retirements of property. Because of the continued rapid improvement in public utility equipment and the intensified engineering and development work applied thereto, there was little definite or helpful experience on which to base estimates of future useful life. The retirement reserves which were accumulated were, therefore, based on imperfect and necessarily broad business judgment, and naturally varied between wide limits in different properties due to varying characteristics, differences in profitableness of business, and the inevitable differences in opinion with respect to future developments.

This was the situation up to about fifteen years ago when present methods of regulating public utilities had their real origin. While it was necessary even in earliest rate cases to give some attention to depreciation, it was some years before accounting systems were freely prescribed, including methods of accumulating reserves. Today nearly all our states have commissions regulating at least a part of the local public utility business, and a large proportion of these commissions have prescribed accounting systems which must be followed by all utilities under their jurisdiction. The accounting requirements with respect to provisions for depreciation have varied widely, from a minimum under which each utility was called upon to report the extent of the reserve which it considered suitable under the circumstances, and the method of its accumulation, to a maximum under which the commission required the determination of the useful lives of each important element or group of elements of the property, the net salvage value, the so-called ''wearing'' value, and the dollars of annuity required to accumulate the wearing value during the estimated useful lives on either a straight-line or sinking-fund basis, with specific restrictions as to the use and safeguarding of the accumulated reserve. There was for some years an increasing tendency toward the latter character of accounting requirements and for accumulating the retirement reserve through equal monthly charges to operating expenses on the theory that the interests of the customers required full regular provision for the future integrity of the property regardless of the degree of present profitableness of the business and its returns to investors.

Many public utility executives opposed the practice of uniform charges for depreciation through operating expenses for the reasons that useful life, upon which such charges were based, could not be determined in advance with even an approach to accuracy, and, further, that even if fairly definite estimates could be made, it was not essential that the provision for ultimate retirements should be made at a uniform rate if thereby a reasonable stability of return to investors was prevented. Many accountants were also disturbed by the proposition of mixing the facts of operating costs which they had previously faithfully recorded with estimates of other prospective costs based upon suppositions not supported by tangible evidence.

Public utilities whose business and investments were steadily expanding were constantly confronted with the necessity of maintaining the credit of their properties, and such credit could only be maintained to the satisfaction of investors by an approach to stability in dividend payments and the accumulation of a reasonable surplus. With business fluctuations, to which public utilities in common with other industries are always subject, reduced net income would necessarily require the curtailment of either dividends or appropriations for retirements, or possibly both. The demands of investors being comparatively steady, and the need of reserves for retirements being, on the other hand, intermittent and indefinite, the judgment of many public utilities was that appropriations for retirements might properly be curtailed during periods of depression, and the deficiencies made up in times of prosperity without sacrificing the ultimate adequacy of the retirement reserve. Some of these utilities believed that, even if under extreme conditions it was necessary to postpone certain needed retirements through lack of adequate reserves, the stability of return and credit which curtailment in retirement appropriations permitted would be in the interests of their customers because it would permit new capital expenditures for otherwise impossible expansions of service and continued development of the property consistent with the growth of the community served.

Because of their desire for flexibility in annual provisions for retirements, these utilities have also opposed the making of these provisions through charges to operating expense. Utility executives have become accustomed to certain standardized operating ratios and stability of expenses other than for known seasonal fluctuations. The injection of new intermittent or fluctuating charges for retirement purposes would cause confusion and difficulty in cost analyses without compensating advantages. Such utilities, for the reasons given above, opposed any provisions of prescribed accounting systems which called for uniform appropriations for retirements, however charged, or for flexible charges through operating expenses, as being contrary to the best interests of the industry and its patrons.

Much confusion resulted from the wide differences in prescribed accounting practices in the different states. Many large utilities, operating in more than one state, were embarrassed by conflicting accounting requirements. Other utilities, affiliated through holding companies or centralized management, found difficulty in making accurate comparisons of their several operations, as did independent companies which had often found such comparisons helpful. Such lack of uniformity and consistency has been avoided in the electric railway field through the general adoption by the state commissions of the accounting system prescribed by the Interstate Commerce Commission for interstate carriers. No such national authority existed over other utilities. The members of the various state commissions have, however, an unofficial organization known as the National Association of Railway and Utilities Commissioners, by which, through annual meetings and otherwise, the practices and policies of the several commissions are subject to comparison and discussion. This association has long recognized the advantages of uniformity in accounting practice throughout the country, and some years ago it approved a recommendation of the organized utilities and designated a committee to draft a uniform system of accounts for local utilities other than electric railways. This committee worked for several years in collaboration with accounting committees of the national associations of the utilities. A tentative uniform system was presented to the Commissioners' Association by its accounting committee in 1920. This system did not have the full approval of the accounting committees of the utilities. There were various minor differences of opinion, but the important difference involved expense and reserve accounts covering retirements. The proposed classification called for the creation of a reserve through stable charges to expense.

After the submission of this proposed classification further conferences were held between the accounting committees of the Commissioners' Association and of the utilities. The result was the making of fundamental changes in the provisions of the uniform classification. The revision with respect to retirement accounting lies in the creation of a reserve for retirement purposes through charges to operating expense or appropriations from surplus, or both, at the option of the utility. The requirements as to uniformity of appropriations are also relaxed, as shown in the following language from the descriptive text of the "Retirement Reserve" account: "The purpose of the account is that the burden of such losses may be as nearly as is practicable equalized from year to year but *with due regard for amount of earnings available for this purpose each year.*" (Italics supplied.) The text under "Retirement Expense" and "Appropriations to Reserves" provides that either, exclusively or supplemented by the other, shall be "sufficient to cover all retirement losses that may reasonably be expected."

Nowhere in the uniform system of accounts is the word "depreciation" to be found in connection with matters here considered, and the language of the text makes it perfectly clear that the purpose of the reserve is solely to take care of actual retirements when they occur. Obviously such a reserve is smaller than a so-called "depreciation reserve" which it replaces, because there is always absence of newness in any seasoned property even though retirement of property elements is not imminent. The smaller reserve can be accumulated through smaller annual appropriations than were required under the older prescribed practice. This would be particularly true during the early years of a utility when revenues are usually no more than sufficient to take care of necessary current disbursements. When, however, a property has reached maturity the direct requirements of the old and new accounting methods approach consistency.

The revised uniform system was presented at the annual convention of the Commissioners' Association in Detroit in November, 1922, approved and recommended to the various state commissions for their formal adoption and use by the utilities under their jurisdiction. . . .

It is reasonable to assume that the adoption of this uniform system marks a new era in public utility accounting, particularly as far as retirements are concerned. The utilities are relieved from unwarranted restrictions and permitted to exercise a degree of discretion in the administration of their finances consistent with that enjoyed by unregulated industries and conducive to improved credit, which, in turn, means a lower average cost of money and lower rates for their service. . . .

With the adoption of this new less comprehensive reserve for retirements the question arises for each utility or similar class of utilities as to what constitutes a reserve "sufficient to cover all retirement losses that may reasonably be expected." This is not a question that can now be given a general authoritative answer. It depends not only upon the past history of public utilities in the matter of actual retirements, but also upon the relative requirements and prospects of the future. . . .

Some indication as to the size of a suitable reserve may be gathered from past experience and the results of appraisals in which so-called accrued depreciation has been estimated. This accrued depreciation rarely exceeds 20 per cent of the undepreciated value of the property, and in rapidly growing properties may be less than 15 per cent or even 10 per cent. Too much dependence should not be placed upon such estimates because of lack of uniformity in the methods of their determination, that is, whether based upon age and useful life or upon inspection or a combination of both.

Assuming depreciation estimated at 15 per cent, it is not conceivable that expenditures could be made in any one year to restore all the depreciated property to newness. In fact, historical data are lacking to show that as much as 50 per cent of this amount could profitably be spent except under very unusual conditions. Some provision should be made in such a reserve for casualties which cannot be foreseen but which experience shows may reasonably be anticipated. There may be real significance in a recent decision of a commission in the case of a large eastern utility, in which decision the commission stated that it would authorize appropriations to a retirement reserve sufficient to build it up to 10 per cent of the value of the property, but when the reserve had reached this limit, it would authorize only sufficient further appropriations to maintain it. Although such findings have heretofore been very rare, it would not be surprising if rate decisions of other commissions in the future showed a similar disposition to define appropriate limits to retirement reserve consistent with the characteristics of the property under consideration.

With such limits fixed and in effect for a considerable period of time, it is not clear that commissions or courts would be justified in making deductions for accrued depreciation in excess of the reserve limitations. In fact, there would be no occasion for making any deduction for accrued depreciation if certain simple accounting adjustments were made in rate proceedings. The question of accrued depreciation has in the past occasioned so much controversy and uncertainty in rate cases that any program by which such controversy may be entirely avoided without injustice to any parties at interest is much to be desired.

As an illustration of the way in which a rate case might be presented, the following figures are assumed for a typical electric light and power company. This company has property, including working capital, valued at $1,100,000, of which $1,000,000 was furnished by investors, the remaining $100,000 coming from an accumulated retirement reserve, presumably invested as far as necessary in working capital and other current assets. This property has annual revenues amounting to $275,000, with corresponding operating expenses and taxes of $165,000, leaving a balance for retirements, return to investors, and surplus, of $110,000. It is assumed that an 8 per cent return should be earned upon the entire investment in the property, amounting to $88,000 per annum, and that an appropriation of $25,000 is needed to maintain an adequate retirement reserve. Not all of this $25,000 is required from current revenues in addition to the $88,000 of return, but a part comes from the return on the property in which the retirement reserve is invested. If this property has shared proportionately in the $88,000 earned for return, it has earned for itself during the year the sum of $8,000. If this sum is first appropriated for retirements, there remains of the required $25,000 total only $17,000 to be further provided from current revenues, instead of the full amount which would otherwise be necessary. The $17,000 net retirement requirements, plus the $88,000 earned for the reserve and for return to investors, make a total of $105,000 to be drawn from the above balance of $110,000 available for these purposes, leaving a margin of $5,000, or a fraction of 1 per cent for surplus and contingencies.

Exactly the same result would be obtained under the older methods by an allowance of $85,000 return (8 per cent on $1,000,000 of "depreciated" value or investment) and the full retirement requirements of $25,000. In the proposed method the full value of the entire property is determined with no attention to accrued depreciation; all expenses, uncertainties, and controversies over its determination being avoided. The only new factor involved is the return earned by the retirement reserve, which is directly deducted from the total required current allowance for retirements. Investors are allowed a full return on the property which they have furnished and that only, namely the total value less the retirement reserve. If in any year the entire property failed to earn 8 per cent, the earnings allocated to the reserve would obviously be reduced. In the event of unusual reverses it might be necessary to reduce the direct retirement appropriation or the return to investors, or possibly both.

Before full justice is assured to all parties concerned one other question must have consideration in any specific rate case, *i.e.* whether or not the retirement reserve, if inadequate, is consistent with the corporate surplus, which is the property of the stockholders, and the returns which have been distributed to investors from this surplus in the past. It is possible that a utility might deliberately restrict its retirement reserve to an inadequate amount while accumulating an excessive surplus or distributing excessive returns, or both. It is, therefore, necessary, when the retirement reserve appears inadequate, to study the financial history of the company to see whether or not this reserve has been discriminated against, and if this should be the case, to determine, for the purposes of a rate case (and actually set up as speedily as possible), a retirement reserve consistent with the history of the property. Such a study cannot be complete in some cases because of missing early records, but comparatively few cases will be found in which the record is not sufficient to form a reasonable judgment regarding the matter in question.

It is unfortunate that the problem cannot be further simplified, but it is believed that more equitable results can be obtained by the proposed method than the older one which requires deduction from valuation for depreciation based upon necessarily inaccurate estimates without regard to the company's financial history. If a utility appears before a commission in a rate case without any retirement reserve and with a showing that it has not been able to create such a reserve and has failed to earn a normal return for investors after continuous exercise of its best business judgment, then, under the proposed method, the investors would be entitled to a return upon the full value of the property, and the revenue should also provide for at least the full current retirement requirements.

The more difficult question arises as to what should be done in the case of a utility which has distributed a fair though not excessive return to investors, but has failed to maintain any retirement reserve. If it is found that no important retirements have been neglected or are impending, it cannot clearly be asserted under the new uniform accounting system that the utility has pursued an incorrect policy. By paying normal and regular returns it has been able to secure money at lower rates than if its return had been irregular and deficient. If a reserve had been created through a corresponding sacrifice of return to investors, the ultimate cost of service might prove to be greater than if the reserve had been postponed to a time when it was currently needed and when it could be created in connection with lower money costs based upon established credit.

The necessity for consideration of the relative rights of investors and the retirement reserve is recognized in the new uniform system of accounts. It is obvious to any one with business experience that wages for intermittent employment are higher than those for regular employment. This is just as true of capital, which is a product of past labor, as it is of current labor. If capital has an intermittent return, its total required return over a period of years will be higher than if this return were uniform, and the cost of the product to which this capital is devoted will be increased. Efforts are being made in all lines of business to stabilize employment and business activities with a view to reduction in greater uniformity of price levels. If public utilities can so stabilize their returns as to decrease their costs of capital without sacrifices involving an offsetting increase in other costs or jeopardizing their service, they should be not only permitted but encouraged to do so. They will thereby insure the continuance of their securities in the investment class into which they have steadily been moving from the speculative group, which in itself implies a lower rate of return.

It is not to be expected that full reversal of former established practices of the commissions calling for stable retirement provisions and variable return will be brought about promptly. There will doubtless be hesitation regarding the propriety of extreme fluctuations from year to year in retirement provisions. Rate cases will also be heard in which utilities will claim allowances for retirements that are greater than current appropriations, on the grounds that the latter are subnormal because of poor present business, or at other times customers will contend that appropriations were excessive because greater than normal and should not be allowed in full. Such contentions must be duly upheld or denied in the light of the new accounting system, which provides for any needed departures from normal appropriations whenever there are departures from normal business. It will accordingly be necessary, unless or until full stability of return and flexibility of retirement appropriations are recognized as standard practice, to set up some normal standard of retirement appropriation in the light of existing reserves and withdrawals therefrom, and also the extent to which departures from normal may be proper, or, as an alternative, to determine a period of years within which the average of appropriations shall be normal without limitations upon any single year. If the latter plan, which provides maximum flexibility, is adopted, the period of years for a mature property should be selected with due regard to business cycles. Based on our past general experience, these cycles may run from prosperity through depression and back to prosperity in periods varying from three and one-half to ten or more years. The shortest period is obviously too brief for the purpose in mind, and ten years or an approach thereto appears not unreasonable for equalizing retirement provisions in the absence of abnormal conditions. . . . After the new uniform system of accounts has been in use a sufficient number of years to permit, where still necessary, the accumulation of adequate retirement reserves and the establishment of definite policies as to suitable normal totals, there will be possibilities of further simplification of rate procedure. The new accounting system provides a foundation for the use of the retirement reserve in a simple automatic adjustment of rates similar to that embodied in service-at-cost railway franchises. These service-at-cost franchises provide a barometer fund with upper and lower limits designed to indicate the propriety of decrease or increase in fares. If, as appears not unreasonable, it may safely be assumed that there is no very definite fixed sum representing a reserve always suitable for retirement purposes, but, rather, that such a reserve may safely fluctuate between upper and lower limits, differing by a material percentage of the investment in the property, such a reserve might serve as the service-at-cost barometer. Its upper limit would be fixed with a view to maximum possible retirement during a period of years, with liberal provision for casualties and the lower limit would be designed to provide for expected retirement needs of the near future without sacrifice or service efficiency. . . .

When, with liberal appropriations to the reserve and normal returns to investors, the reserve had grown to its maximum limit, this fact would indicate the propriety of a reduction in rates to the extent of the permissible curtailment of retirement appropriations. On the other hand, if large withdrawals from the reserve or scant appropriations, or both, brought about a reduction of the reserve to its lower limit, this fact would in turn indicate the need of a rate increase to provide for more liberal appropriations. This plan assumes stability in the return to investors; this return always being maintained at a rate high enough to attract new capital to the business in competition with other needs for such capital. With a fluctuating volume of business it would, therefore, be the appropriations for retirements which would fluctuate rather than the return to investors, these appropriations being reduced below normal during depressions and increased above normal in prosperity. With maximum and minimum retirement reserve limits suitably fixed, it might easily be possible to go through the ordinary business cycle without rate changes, but such changes when necessary would involve very few complications or formalities.

One disturbing factor remains for the time being in connection with a too prompt adjustment of retirement reserves to conform to the provisions of the new standard system of accounts. This system, with its reserve intended to take care of retirements only, will leave the utilities without full provision for so-called accrued depreciation. In condemnation and confiscation cases the courts have in many instances approved deductions from cost of reproduction for theoretical accrued depreciation. The regulatory commissions have adopted this practice to a less extent in rate cases. Both courts and commissions have at times held that existing retirement reserves have no necessary controlling relation to such deductions. If such practice continued, the utilities would be confronted with possible losses in value represented by the difference between the determined accrued depreciation and the reserve which had actually been accumulated for retirements.

The logical solution of this difficulty would seem to be a change in the practice of the tribunals to conform to the logical and economically sound provisions of the accounting system.

124. Depreciation—An Operating Expense or an Appropriation of Earnings? *

Depreciation accounting procedure varies greatly among different public service enterprises. It departs in a variety of ways from the orthodox accounting plan of making predetermined, periodic depreciation charges on the basis of expired life expectancy, and keeping records of accrued depreciation, in the form of depreciation reserve accounts for individual assets. Among the variations from orthodox procedure we find such devices as blanket depreciation reserves for each class of assets; blanket ''retirement reserves,'' applying to all the assets of a particular company; ''retirement accounting,'' involving the charging of the original cost of a retired unit as an operating expense at the time of the retirement; and ''replacement accounting,'' involving the charging of the replacement cost of the retired unit as an operating expense.

Reasons for Variety in Public Utility Depreciation Accounting Methods

Where blanket retirement reserves are used, depreciation charges (or ''retirement appropriations'') are sometimes made on a predetermined unit basis such as a specified amount per kilowatt hour generated or a basis which bears some relation to the investment in fixed assets; or they may be varied at the discretion of the management. The aim of the annual depreciation charge may be the orthodox accounting goal of measuring expired life expectancy, or it may be the provision of sufficient funds only for average annual property retirements; so that the retirement reserve is only a retirement suspense account with even the possibility of occasionally having a debit balance.[1]

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* Excerpts Eugene L. Grant, *Journal of Land and Public Utility Economics*, IV (1928), 251-256.

[1] In his testimony before the Interstate Commerce Commission in the original hearing on Order 15100, the late Robert A. Carter of the Consolidated Gas Company of New York stated that in his opinion there was no reason why a retirement reserve should not occasionally have a debit balance.

Probably a great many public utilities in their actual practice are shooting at a mark somewhere between these two limiting objectives.

It seems probable that these various departures from orthodox accounting theory have often been motivated by practical considerations, which in some cases have been widely removed from the theoretical arguments advanced to support the procedures adopted. Some of these motives have been related to accounting convenience. In this respect, for instance, the practice of the railroads in charging replacement costs of ties and rails as operating expenses has distinct advantages over the orthodox accounting procedure.

Another important motive probably has arisen out of the relation between the accounting and the rate-base aspects of depreciation. Orthodox accounting theory assumes that the cost of any asset is merely a prepaid expense which, because it happens to apply to more than one fiscal period, should be distributed over the life of the asset by means of depreciation accounting. On the other hand, public utilities have generally contended in rate cases that a public utility property is a single unit of fixed capital with perpetual life, and that if the property is properly maintained there need be no depreciation. In other words, the usual public utility contention is that the only kind of depreciation which need be considered in determining the rate-base is the kind which is a result of inadequate maintenance. To be consistent, this view would seem to imply retirement or replacement accounting, or a retirement reserve which is essentially a retirement suspense account.

But perhaps the most important motive which has influenced utility managers in favor of unorthodox depreciation accounting has been the desire to adjust retirement charges from year to year in accordance with financial needs. This has been recognized in the Interstate Commerce Commission opinion on Orders 14700 and 15100 with regard to depreciation charges of telephone companies and steam railroad companies.[2]

Flexible Retirement Charges

In the gas and electric field this motive has led to the development of the "flexible" retirement reserve by many companies. Thus, if earning statements of gas and electric companies are examined, instead of saying "Operating expenses, including depreciation," they will frequently include no allowance for depreciation in operating expense, but will come out at the end after interest and all other charges have been met with a ''Balance available for reserves, retirements, and dividends.'' The annual depreciation or retirement charge is thus apparently an appropriation of profits, and is frankly variable with net earnings.[3] . . .

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[2] 118 I.C.C. 295.

It is not the purpose of this article to enter into the general aspects of the public utility depreciation accounting controversy. However, it seems worth while to examine critically the contention that it is important to public utility credit to show the depreciation or retirement charge as an appropriation of earnings rather than as an operating expense, and to make this charge variable with earnings rather than a relatively constant figure dependent on a predetermined rate. Doubtless the managers of all public utilities using this unorthodox accounting procedure would include an allowance for depreciation or retirements as an operating expense in any rate-hearing before a regulatory body.[4] Thus this procedure is frankly an accounting fiction, and an important consideration is whether the practice serves the purpose for which it is designed, and whether in some instances it may not eventually prove a boomerang to the utilities using it. Finally, what is the effect of the flexible retirement charge on the interests of the bondholders and the consumers?

A flexible depreciation or retirement charge has been defended on the ground that it may be used to maintain the dividend rate on common stock at a constant figure through periods of high and low earnings, and thus improve utility credit. If this defense is employed, then in what situations will the maintenance of the dividend rate require that the annual depreciation or retirement charge be decreased below its normal figure?

A well-managed utility may conceivably find its net earnings decreasing for any one of several reasons, which may be related to an increase in operating expenses, or to a decrease in revenues or possibly both. Operating expenses may be enhanced by some sudden uncontrollable cause, such as a coal strike increasing the expenses of a steam-electric utility or a gas company, or a year of abnormally low run-off increasing the expenses of a hydro-electric utility. Or they may be increased by a gradual rise in the costs of labor and materials. Revenues may fall off on account of an industrial depression in the community served, or a fundamental change in public demand, resulting perhaps from such a cause as the competition of a substitute commodity or service.

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[3] "Public Utility Depreciation Accounting," *Journal of Land and Public Utility Economics*, II (October, 1926), 369-384.

[4] For instance, the Northern States Power Company which reports in its earning statements "Balance available for reserves, retirements, and dividends" (although its retirement appropriations have shown no such marked fluctuations as those of some other utilities using the flexible retirement appropriation method) was allowed a 2.4 per cent annual retirement expense in a hearing before the Wisconsin Commission. See *Re Northern States Power Company*, P.U.R. 1926-C 46.

Instances of a change of the last type may be found in many communities where the automobile has caused a decrease in the demand for street-railway service to such a point that no rate could yield a fair return on the investment. In such cases the manipulation of a flexible depreciation or retirement charge below its normal figure, in order to continue paying dividends, is probably a highly undesirable procedure from the standpoint of the bondholders and the public. Such reduction of the depreciation charge may, of course, serve the stockholders' immediate ends by repaying them part of their investment after their equity is already gone, and it may assist them in unloading their holdings at more than they are actually worth.

On the other hand, if the reduced net earnings are a result of some cause which requires an upward readjustment of rates as a remedy, the maintenance of the apparent earnings available for dividends by means of depressing the depreciation or retirement charge below its proper average figure may seriously handicap the utility in securing the needed rate readjustment, when its case is presented to the regulatory commission. The fact that the utility was showing apparent earnings sufficient to maintain the dividend rate at the previous figure might interfere with a commission's willingness to permit a higher rate-schedule. Certainly this would be true to the extent that the commission's decision was influenced by the political aspects of rate-increases, as distinguished from the true equities in the situation which might appear only after careful analysis.

If there is any justification for the use of the flexible retirement charge to maintain dividends, it rests on the clearly temporary nature of the reduction in net earnings which may result from such causes as a coal strike, an unusually dry year, or temporary industrial depression. But the meeting of just such situations is one of the important reasons for the retention of a portion of profits as surplus, rather than declaring all profits as dividends as soon as earned. The latter practice tends to transfer the risk of temporarily reduced earnings from stockholders to fixed-return investors and consumers.[5] Moreover, the necessity of reducing the depreciation or retirement charge below its average figure through such a temporary depression period, in order to maintain the previous dividend rate, implies that there are no undivided profits in the form of corporate surplus. A corporation with an adequate surplus has no need of the flexible depreciation or retirement charge to enable it to maintain its dividend rate through an obviously temporary period of reduced net earnings.[6]

The importance of a public utility plowing back a certain percentage of its earnings into the business rather than declaring them all as dividends is generally recognized. The practice has a favorable effect on public utility credit, and the contention of utility managers that utility earnings should be at a level which will permit this is undoubtedly sound. The implication that this plowing back of earnings will not take place is a serious defect in the case presented by the advocates of the flexible retirement appropriation.

[5] To the extent that the period of reduced earnings coincides with a period of reduced demand, and/or reduced burden on the property and hence less need for retirements, some lowering of retirement appropriations may be justified from the standpoint of consumers.

[6] If we accept orthodox depreciation accounting theory for public utility properties, the payment of dividends which could not be paid except by the reduction or the omission of the normal depreciation charge is open to the serious criticism that dividends are being paid out of capital. The New Jersey Commission suggests this in its opinion in *Re Public Service Railway Company* (P.U.R. 1918-E 910):

"In the year 1917 the appropriation for depreciation reserve, which should have been credited thereto, was depleted to the extent of over $500,000 and used to pay dividends.

"To divert to the payment of dividends money credited to or which should go to the credit of this reserve, and so destroy the assurance of the continuance of safe, adequate and proper service, is wholly unjustified and a violation of the paramount duty of the utility.

"If the earnings of a utility will not admit of the maintenance of a proper depreciation reserve and a fair return upon the property used and useful, the remedy is not to be found in the reduction of the amount carried to or the depletion of the depreciation reserve, but in a prompt application to this Board for relief."

See P.U.R. 1920-C 505 and P.U.R. 1922-C 248, for similar comments by the Nebraska and Oregon Commissions.

But, of course, the flexible retirements appropriation starts with the assumption that a public utility property is a single unit of fixed capital with perpetual life, that retirement costs are merely maintenance costs, and that a retirement reserve is essentially a maintenance suspense account. Even if we accept these assumptions as valid, the reduction of the retirement appropriations below the average retirement cost in order to maintain dividends is open to criticism as a departure from conservative financial policy.

Flexible Retirement Charges in Relation to Public Utility Credit

Finally, to what extent may public utility credit really be improved by the flexible retirement appropriation, in the instances in which it may come into play as a stabilizer of the dividend rate? Such an improvement of public utility credit must depend either on the superficial nature of analysis by investors, or on the effect of provisions in state laws restricting the character of investments for such institutions as savings banks and insurance companies.

Investors in common stock naturally prefer a uniform dividend rate. A constant dividend rate implies stability of earnings, and this implied stability of earnings may improve the market for other securities than the common stock, to the extent that investors consider the dividends actually being paid instead of analyzing the underlying situation. For instance, a certain electric utility recently maintained its common stock dividend through a two- or three-year depression period by a very low retirement appropriation (about 0.1 per cent of the book value of the property) and successfully financed the completion of a new power plant by the sale of bonds and preferred stock. Doubtless the maintenance of the common stock dividend (which was passed shortly after the completion of the new power plant) materially assisted in the financing, although it would be very difficult to place a quantitative value on this effect.

Savings bank investment laws in a number of states require that the common stock of a railroad or other type of public service enterprise shall have paid dividends of a certain amount for a specified period of years as a condition precedent to eligibility of the company's bonds for savings bank investment. Examination of the provisions of such laws as reported in the State and City Department of the *Commercial and Financial Chronicle* indicates that restrictions of this character exist in New York,[7]

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[7] The recent bill broadening the restrictions on savings bank investments in New York State, which was signed by Governor Smith on March 21, 1928, contains the following provisions with respect to eligibility of bonds of gas and electric companies: "for a period of five fiscal years next preceding such investment . . . such corporation shall have for each such year either earned an amount available for dividends or paid in dividends an amount equal to four percentum upon a sum equivalent to two-thirds of its funded debt." The provision with respect to the eligibility of bonds of railroads and telephone companies provides for having earned or having paid as dividends at least 4 per cent on the outstanding capital stock. See *Com-*

New Jersey, Massachusetts, Rhode Island, Connecticut, Michigan, Wisconsin, Minnesota, Florida, Washington, North Dakota and New Mexico. These restrictions apply more frequently to railroad bonds than to bonds of other types of utilities. New Hampshire and Ohio have similar provisions with respect to the eligibility of stocks for savings bank investment. Clearly, where such laws exist, utility credit would have been adversely affected if a relatively constant depreciation charge interferes with dividend payment, while a flexible charge allows it. This unfavorable effect on public utility credit would take place to the extent that the rate at which the utility can borrow money is increased by the resulting ineligibility of the utility's bonds for savings bank investment. One may seriously question the wisdom of such laws as a real protection to the savings bank depositor, however, if their result is to weaken the security behind the bonds by encouraging the use of a variable depreciation charge, which allows the payment of dividends when with a predetermined depreciation charge such payment would more than wipe out the utility's surplus.

The alternative to requiring the payment of dividends for a period of years as a condition precedent for eligibility seems to be the establishment of a certain relation between "net earnings" and interest requirements of the funded debt. (Of course, both types of restriction may be inserted in one law.) In such laws net earnings are usually not adequately defined so as to indicate whether they shall be computed before or after provision for depreciation. However, the recent New Jersey law is explicit, stating that net operating revenues "after all operating expenses, but before deducting charges for depreciation and renewals and Federal taxes," shall have averaged two-and-one-half times average annual interest requirements for the past three years.[8] The Maine law, on the other hand, states that net income "shall be determined after deducting all operating expenses, maintenance charges, depreciation, rentals, taxes and guaranteed interest and dividends."[9]

The fundamental justification for the flexible retirement appropriation is, therefore, the maintenance of public utility credit

mercial and Financial Chronicle CXXVI (March 24, 1928), 1864. This is an amendment to Laws of 1914, ch. 369, sec. 239.

[8] Laws of 1926, ch. 305, sec. 5. See also *Commercial and Financial Chronicle* (State and City Department) CXXIV (May 21, 1927) 3102.

[9] R. S. 1916, ch. 52, sec. 27 VII, *b* 5 as amended. See also *Commercial and Financial Chronicle* (State and City Department) CXXIV (June 18 1927), 3661.

through a temporary depression, and it may be used effectively for this purpose. Perhaps in a few instances the long-run interests of the bondholders and consumers may be served by the maintenance of common stock dividends which would have to be passed if uniform depreciation or retirement charges were used, but the danger from the bondholders' standpoint is that public utility managers operating under this system will be likely to consider every depression temporary, until it has proved otherwise, and continue as long as possible to pay dividends at the expense of the protection of the bondholders' investment. Such a policy might easily force a receivership and reorganization which otherwise might be avoided, and therefore result in losses to the utility's bondholders and discomfort to its customers.

125. Telephone and Railroad Depreciation Charges *

The Telephone View. The position of the telephone companies, briefly stated, is that the ultimate expense of furnishing service includes the cost of everything used up in the process, whatever it may be. It includes the cost of things that are used up slowly, such as automobiles, switchboards, building, pole-lines, and other items of plant, just as inevitably as it includes the cost of things that are used up rapidly, such as labor, gasoline, coal, lead pencils, paper, and the like. As we understand the view of these companies, depreciation expense represents the cost incurred during an accounting period in the process of using up in service items of physical property whose lives extend over more than one such period, regardless of how they are used up. This cost is a part of, and should be shown in, operating expense; it should be shown when it is incurred, and it is incurred throughout the life of the property in service. It should, therefore, be charged to operating expense in periodical installments throughout this service life. Replacements, these companies say, do not measure depreciation expense, for it is determined by the amount and cost of the property used up. It exists whether or not the property is replaced, and is incurred regardless of whether depreciation charges are accrued. Such charges should be made in order that the accounts may properly record the facts. As the result of making them a reserve will be created which will, if the charges have been accurately estimated, at any time equal the loss in existing property due to the process of consumption in service. This reserve protects the integrity of the investment.

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* Excerpts from "Telephone and Railroad Depreciation Charges" (Dockets Nos. 14700 and 15100), *Interstate Commerce Commission Reports*, Vol. 118 (1926), pp. 301-319.

The Railroad View. The position of the steam railroad,[1] gas, and electric light companies, stated briefly, is that a railroad or public utility property is a composite of many separate units and should be so considered with respect to depreciation. While most of these separate units have terminable lives and are worn out in service or abandoned from time to time for better substitutes, there is no depreciation in the composite property so long as it is well maintained. Maintenance is the making of needed repairs and replacements. If properly maintained, the railroads say, the composite property does not depreciate or lessen in value or service ability. In fact it may be worth more to a prospective purchaser when seasoned by long continued operation than when new. No reserve is needed to protect the integrity of the investment, but the creation of such a reserve may be desirable to spread the cost of retiring certain large units of property and prevent a disproportionate burden upon the operating expenses of any one year. In the case of a large, composite property which has ''struck its gait,'' it is claimed that retirements of most property units are about the same in amount from year to year, so that there is no need for such an equalizing reserve. In the case of the larger units, there may be such need, but the reserve should be called a ''retirement'' rather than a ''depreciation'' reserve. Its amount is not a matter of mathematical computation from theoretical service lives, but rather a matter of judgment. Where property is unexpectedly retired, not because it has been worn out, but because some more efficient substitute has been developed, the cost of retirement should be spread, not over the past, but over the future, so that the burden may fall upon those who gain the benefit from the enhanced efficiency. The ascertainment of service lives, upon which what the gas and electric companies call ''theoretical depreciation charges'' are dependent, is, they say, a wholly impracticable undertaking requiring a knowledge of the future which no one has. It is contended that the making of such depreciation charges merely results in the accumulation of a huge reserve which will in time fluctuate around 50 per cent of the recorded investment; that such a reserve serves no useful purpose; and that it is a burden both upon the patrons of the company and upon the investors in its securities. If it were to be assumed that the composite property would at a certain time come to the end of its life, there might be need for such a reserve, but in most cases such properties may for all practical purposes, it is asserted, be regarded as perpetual.

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[1] The returns to the questionnaire sent out by the depreciation section indicate that not all of the steam railroads may be of the same mind, but these differences of opinion were not developed at the hearings.

Analysis of the Opposing Views. The question raised by this divergence of opinion merits the most careful consideration. There is general agreement that, with the exception of land and grading, most of the property units which make up the plant of a railroad or telephone company are gradually worn out in operation or are abandoned from time to time in favor of better substitutes. There also can be no doubt that the cost of such worn-out or abandoned property units is a part of operating expense to be charged against the service. The basic question is whether such cost should be charged in bulk at the time when each unit is retired, or should be anticipated by periodical installments spread over its service life. . . .

While the steam railroads, gas, and electric companies insist that the retirements of most units of a large, composite property tend ultimately to equalize, that is, to become the same in amount from year to year, no data were presented which furnish adequate support for this contention, nor is it confirmed by our own records. Furthermore, one of the chief reasons why these companies object to depreciation accounting is apparently a desire to avoid such equalization of retirement expenses. They wish an opportunity when business is poor to postpone or defer retirements and consequent charges to operating expense, until business is good. Unless this opportunity be afforded, they say that at times their credit may suffer seriously, either because of a suspension or diminution of dividends or because of an unfavorable showing of net income. This amounts to saying that they wish to use the expense of maintaining the property as a form of shock absorber, allowing this expense to fluctuate in harmony with relative prosperity.

While the steam railroads oppose the making of depreciation charges and the creation of depreciation reserves, they have in the past quite generally adopted and defended practices which, when analyzed, are shown to have in many respects much the same practical effect. Thus, prior to our uniform system of accounts, it was the practice of many of the steam railroads to charge to operating expense, not only the cost of repairs and retirements, but also the cost of additions and betterments in substantial amounts. That this was the practice can easily be shown by our own records; but that is unnecessary, for its existence may be established by reference to certain decisions of the Supreme Court of the United States: Union Pacific Railroad Co. *v.* United States,[2] and Illinois Central Railroad *v.* Interstate Commerce Commission.[3] After the establishment of the uniform system of accounts, which prohibits the charging of additions and betterments to operating expense, the railroads have consistently urged that they are entitled to earnings, sufficient, not only to pay reasonable dividends, but also to permit the accumulation of a substantial surplus which may be invested in additions and betterments. . . .

The cost of property consumed in operation is plainly a part of the cost of rendering service. Manifestly the accounts should conform to and adequately record this fact. The question is whether a record is adequate which takes no account of this cost until the final disappearance of the units in question, or whether its continuing nature should be recognized by entry of proportionate, periodical charges to expense accounts throughout the service lives of the units. We shall consider in turn each of the objections urged against the latter course and then discuss its advantages.

1. Perhaps the most important objection is this: That the method of spreading the cost of property used up in service in installments over service life, by means of "theoretical depreciation charges," results in the creation of a depreciation reserve which serves no useful purpose and is an unnecessary burden upon the patrons of the company and the owners of its securities. In considering this objection, we shall assume that it is possible to estimate with approximate accuracy the prospective service lives of the various property units. The contention that this is impossible will be separately considered.

Upon this assumption it is clear that the ultimate cost will be the same, whether it be charged in bulk when the unit is retired or whether it be spread in installments over its service life. If we could conceive of a telephone or railroad company using but a single unit of property with the intent of abandoning operation when that unit ceases to be fit for further use, the desirability of charging the cost of the unit to operating expense in periodical installments throughout its life would hardly be open to question. We are faced, however, by no such simple problem. The property of a telephone or railroad company is actually a composite of many units and as they are retired they are ordinarily replaced, either in kind or by better substitutes. Future abandonment of operation is seldom contemplated. And in a growing business, which is the normal situation, new units of property are continually being added. Under such circumstances it will readily be seen that if the installment or depreciation method of charging the cost of property consumed in service be employed, the total of the installments which have been charged will always exceed materially the total cost of property which has been retired. There will always be a balance in the depreciation reserve representing installments which have been charged for units still in service, and so long as the company continues to grow this balance will tend continually to increase. It is this balance which, as the opponents of the installment or depreciation method of accounting see it, represents an unnecessary burden. No need exists for such a reserve, they contend; the utmost that may be needed is a comparatively small reserve which may be drawn upon at times of abnormally large retirements to prevent a disproportionate load from falling upon the operating expenses of any one year.

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[2] 99 U.S. 402, 420-1 (1878).

[3] 206 U.S. 441, 461-2 (1907).

Question may arise as to how depreciation charges can burden both patrons and investors. It should be borne in mind that the accruing of depreciation charges upon the books does not necessarily mean that corresponding amounts are collected from the public served. If, after depreciation charges have been accrued, net earnings are insufficient for the payment of a reasonable return, then the burden of such charges is borne in whole or in part by investors. Indeed depreciation charges may not involve the diversion of actual funds from either patrons or investors, for where a company is operating at a deficit they will serve only to increase the extent of the recorded deficiency. Stated in another way, if depreciation charges are an unnecessary burden, as their opponents claim, that burden will fall upon patrons where revenue is sufficient to cover such charges and leave a reasonable return. Where revenue is inadequate the burden may be shared by patrons and investors or be borne wholly by the latter.

But wherever they may impinge, the questions are whether depreciation charges are a burden and, if so, whether that burden is necessary or unnecessary. The latter is, of course, the vital question and the one to be answered first. It may be stated thus: Are depreciation charges necessary in order that the accounts may furnish, as nearly as may be, an accurate record of the facts of operation?

If the various units of railroad and telephone property had fixed and definite service lives, it is doubtful whether the propriety of an affirmative answer would be questioned. Suppose, for example, it were known with certainty that a railroad car, once acquired, would last in service twenty years and no longer. Upon such an assumption can it be doubted that each year there is a consumption of the service life of the car which is a cost of operation, or that this fact ought to be recorded in the accounts? But under the retirements method no record of this fact appears until service life ends, and the cost which has been accruing over a twenty-year period is shown in its entirety as an expense of the twentieth year alone. Is the situation changed by the fact that the service lives of the various units of property, instead of being certain and definite, are to a considerable degree uncertain and indefinite? Plainly this circumstance in no way affects the principle which ought to govern, but only makes it difficult to ascertain the fact to be recorded. To this difficulty we shall advert later.

It is conceded that the service lives of most units of railroad and telephone property are terminable. It is also conceded that the consumption of these units in service is an expense of operation. The question is only whether this expense should be accounted for, in the light of the best available information, as a continually accruing expense, or whether it should be accounted for as an expense, suddenly incurred in its entirety at the time when the unit is retired. We have no hesitation in reaching the conclusion that the former method of accounting will conform much more closely to the facts than the latter.

The depreciation reserve, when all is said and done, is merely a record of the undoubted fact that the service lives of existing property units have to a certain extent been consumed. It may be an imperfect record, subject to correction or modification from time to time, but no question can exist as to the underlying fact. The fact may also be that appreciation has taken place in certain other property units, or that accumulated surplus is sufficient to counterbalance the effect of depreciation, or that the earning capacity of the company has enhanced the value of its securities, or that yearly retirements equalize to such an extent that operating expenses will be approximately the same whether or not there is accounting for depreciation. These are all facts which, if established, it may be desirable that the accounts should indicate so far as practicable; but not to the exclusion of the fact of depreciation.

Having reached the conclusion that depreciation charges are necessary in order that the accounts may properly reflect the facts of operation, it is, strictly speaking, immaterial whether or not they burden patrons or investors. Nevertheless that question will repay consideration.

As an aid to clear thinking, let us again assume a company using but a single unit of property with the intent of abandoning operation when that unit ceases at the end of ten years to be fit for good service. To simplify that matter further, let us assume that the value of the unit, aside from depreciation, remains at its original cost throughout the ten years. If, then, one-tenth of the cost of the unit be charged to depreciation each year and collected from the patrons, three courses are possible:

(a) The amount so charged may be regarded as concurrent reimbursement to the company for the portion of the property which has been consumed in service; the amount upon which it is entitled to a fair return being correspondingly reduced. This will be fair to the company, but in the case of the patrons it will have the result that the amount which they are required to pay for service will each year steadily diminish. Thus, at the end of nine years they will be required to pay a fair return upon but one-tenth of the original investment, although the service will be unchanged, the assumption being that the property continues fit for good service until the time of its retirement.

(b) The amount so charged may be segregated in a fund to be applied to the reimbursement of the company when the property is finally retired, in the meantime the patrons to pay a fair return upon the full amount of the original investment. If this course be followed, the amount which patrons are required to pay each year for service will be uniform, but the fund at the end of the ten years will be larger than necessary to reimburse the company for the cost of the property, in view of the interest accumulations.

(c) Obviously there are objections to both of the above plans. Yet another course to pursue would be to require the patrons throughout the ten years to pay a return upon the full amount of the original investment, but to require them to pay for depreciation each year, not one-tenth of the cost of the property, but such amount as will with the accumulating interest produce a fund at the end of the ten years sufficient to reimburse the company for the cost. This is what is known as the sinking-fund method of depreciation.

This simple illustration, however, is purely hypothetical. Railroad and telephone properties are actually made up, not of one but of many units, and normally they are continually growing in size. Moreover, the sinking fund method, while in certain aspects correct in theory, is subject to practical objections for reasons which will hereinafter be explained. The more usual plan in dealing with depreciation is similar to that outlined in (a) above. Amounts collected as depreciation charges, however, are not ordinarily put out at interest but are used for additions and betterments. It is an essential part of this plan that the same accrued depreciation which is represented by the depreciation reserve should be deducted in determining the amount on which the company is entitled to a fair return, for the reimbursement for property consumed in service is concurrent with the consumption and is not deferred until the time of final retirement. The company has the full use and benefit of the sums paid in each year by way of reimbursement, and in practice they are used to acquire new property upon which the company is entitled to return. Thus the gaps in the investment caused by depreciation are filled as they occur.

Clearly this method of treatment is fair to the company. In practice also, it produces results approximately those of the sinking fund method so far as patrons are concerned. They are charged each year somewhat more for depreciation than under the latter method, but there is compensation for this excess in the fact that the accrued depreciation is deducted in determining the amount upon which they are required to pay a fair return. Moreover, with a complex, growing property made up of many units this amount does not continually decrease, as in the case of the theoretical property made up of a single unit.

As will later more fully appear, the doctrine that accrued depreciation must be deducted in determining rate-base value has been upheld very definitely by the United States Supreme Court. That being the case, the depreciation or installment method of accounting becomes a necessary measure of self-protection, so far as the companies are concerned. Notwithstanding these decisions of the Supreme Court however, the railroad, gas, and electric companies are not ready to concede this doctrine, and hence their insistence upon the retirement method of accounting.

The close connection between the two positions is very evident.

It is the presidents' conference committee on valuation that has continually insisted in our railroad valuation proceedings that so long as a railroad property is maintained in "100 per cent efficiency" no depreciation exists, and it is that same committee which in this proceeding has insisted that the retirement method of accounting must be followed. The positions sustain each other, and if one falls the other falls. In our consideration, therefore, of the relative burdens imposed by the depreciation and retirement methods of accounting, we must start with the premise that the former presupposes full deduction of accrued depreciation in ascertaining the rate-base value, and that the latter presupposes no such deduction except where what may be termed "deferred maintenance" exists.

What are, then, the relative burdens upon patrons? So far as operating expenses are concerned, in the one case there will be a fluctuating expense for retirements; in the other there will be, in substitution, a more nearly uniform charge for depreciation. Assuming a new plant, the depreciation charges will normally exceed each year the average retirement expense. Assuming an older plant which has reached and is maintaining its maximum development, in time the depreciation charges will be no greater than the average yearly retirement expense. Assuming a growing plant, whether old or new, the depreciation charges will probably be somewhat greater than the average retirement expense, although the excess will be less for an old company. It must be borne in mind, however, that the retirement method of accounting contemplates the accumulation of reserves in connection with the larger units of property and that to the extent that this policy is followed, the operating expense results of the two methods will more closely correspond.

But when it comes to return upon investment the results of the depreciation method will clearly be much more favorable to the patrons than the results of the retirement method.

One result of depreciation accounting ought not to be overlooked. The theory that needed retirements equalize after a large property has "struck its gait" is only a theory which, as we have stated, is not confirmed as a proposition of general truth by statistics within our knowledge. Under depreciation accounting, the amount which patrons are called upon to pay each year for property used up in service is, comparatively speaking, a fixed quantity. The depreciation reserve acts as a reservoir which absorbs the often violent fluctuations in actual retirements. Under the retirement method, the amount paid each year is a less dependable quantity. It may in some year amount to a serious burden, and the danger constantly threatens that to avoid such burdens the management may neglect retirements required in the interest of good service.

It is further to be noted that the opponents of depreciation accounting attempt to draw a distinction between present and future patrons, accompanying this distinction by the claim that such accounting burdens the former for the benefit of the latter. As we have seen, the merits of this claim are open to question, but regardless of that fact the patrons of today merge with those of tomorrow. No good purpose is served by attempting to draw a line between them and their interests. The object of concern should be the community. What is sound policy for the community is in the long run, sound policy for the individuals who make it up.

2. We come next to the contention that it is only possible to guess at service lives. . . . In the case of railroad and telephone companies, most units of property are not retired because they are worn out.[4] Indeed it is often possible, so far as wear and tear are concerned, to prolong their lives indefinitely by repairs. . . . For the most part, units of property are retired, it is said, because of obsolescence, inadequacy, or . . . because some more efficient substitute has been developed, or because the growth of business has rendered them inadequate for the company's needs, or because some public requirement has made it necessary to shift or change property. It is urged that it is utterly impossible to predict when inventions will be made, or when business will outgrow existing plants, or when public authorities will impose requirements. This being so, the contention is that depreciation accounting is based on a theory that cannot, as a practical matter, be applied except by mere guesses as to the future.

There is substance in this contention, but the future is not altogether inscrutable. It is known with certainty that most units of property will in time be retired from one cause or another. It also is known, where proper records have been kept, how long service lives have been in the past. Some considerable period of time ordinarily elapses after inventions before they are perfected for commercial use. Advance information is thus possible as to the time when changes in the art are likely to render changes in property advisable. Nor is it beyond reason to anticipate the time when business will outgrow existing plant or when various requirements will be made by public authorities. The telephone companies are insistent that it is possible, with the help of past experience and the advice of engineers informed in regard to modern tendencies in the art and the trend of business growth, to reach approximations of future service lives which will be reasonably accurate.

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[4] In view of the retirements of rails, ties, other track material, telephone station apparatus, and many other units of property which might be mentioned, this is, of course, a much exaggerated statement.

The question is whether, because future service lives cannot be estimated with entire accuracy, depreciation accounting must be abandoned as impracticable. For the present it is enough to say that we are satisfied that future service lives can be estimated with sufficient accuracy, subject to public supervision and to modification and correction from time to time, to warrant the use of depreciation accounting. But in the public regulation of this matter, it is desirable to err on the side of overestimating rather than underestimating service lives, for a reason which will appear in connection with the next topic to be discussed.

3. It is urged by the opponents of depreciation accounting that as most property units are abandoned, not because they are worn out, but in favor of some more efficient substitute, the cost incurred in their retirement should be charged, not against past operations, but against the future operations which will be benefited by the increased efficiency. This, of course, is an argument which applies only when the retirement results from obsolescence or inadequacy. The method of dealing with retirements thus suggested is permissible under the present accounting classifications, provided our approval is obtained in each instance.[5] The disadvantages of this method are not difficult to perceive. Under it the community either gains no immediate advantage from the introduction of improvements, or the advantage is materially curtailed. The general effect of such a policy is to discourage or retard the introduction of improvements. As we have

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[5] Account No. 726, "Property Abandoned Chargeable to Operating Expenses," in the steam railroad classifications may be used under the following circumstances: "This account is intended as a suspense account, in which may be included amounts chargeable to Operating Expenses for fixed improvements abandoned directly in connection with improvement or betterment work which are relatively large and the inclusion of which in the carrier's accounts for a single year would seriously distort the accounts. It is to be used only after permission of the Interstate Commerce Commission has been asked and given. The carrier, in its application to the Commission, shall give full particulars concerning the property retired, the amount chargeable to Operating Expenses, and the period over which, in its judgment, the amount of such charge should be distributed."

Somewhat similar provisions are contained in the telephone classification.

above suggested, an attempt in this way to distinguish sharply between present and future patrons and apportion burdens accordingly is unsound. A community, if it is to progress and keep pace with other communities, must be able to take advantage of improved means of doing business as they become available and without mortgaging the future. This will involve prudence, foresight and some degree of present sacrifice; but no other course is consistent with a sound economy. Moreover, depreciation accounting attempts only to place the burden of current losses in service value upon the current users of the property, which obviously is logical. But while the method of charging improvements against the future is not one which is wholly consistent with the fact which the depreciation method of accounting purports to record, it is a method which is open and available for use in emergencies. We are not here dealing with competitive industries but with monopolistic or semi-monopolistic industries where public regulation is needed to protect the public interest. The choice is between permitting such an industry to charge rates which will enable it to make its depreciation charges large enough to meet every conceivable contingency, and holding its depreciation charges down to a more moderate basis but permitting the industry, in the case of some sudden and unexpected development, to spread the cost of retirements over a period in the future. In our opinion the latter course is the preferable one.[6] To this matter we shall advert again in the course of our consideration of the details of depreciation accounting.

4. It is urged that while there is comparatively little fluctuation of earnings in the telephone business, the contrary is true of railroads. This being so, the contention is that while a policy of charging off the cost of property in regular, annual installments may be well adapted to the needs of telephone companies, it is not suited to the needs of railroad companies. The business of the latter swings periodically from a peak of congestion to a valley of depression and back again. Expenses, it is said, must be adjusted accordingly or credit will suffer. It is the custom, according to the testimony, to adjust repair and renewal expeditures in this way. At a time when traffic is moving in great volume, large amounts are spent for the repair and replacement

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[6] An additional reason for such conversation in estimating service lives is afforded by the recent decision of the Supreme Court of the United States, in *Board of Public Utility Commissioners* v. *New York Telephone Co.*, decided April 12, 1926.

of equipment and fixed property. In a time of traffic slump, such expenditures are curtailed. With depreciation accounting, there would be less leeway for such adjustments. They would still be possible in the case of ordinary repairs, but not in the case of retirements. It is claimed that this diminished opportunity to adjust expenditures to earnings might mean a difference in some cases between maintaining regular dividends and passing them with consequent loss of credit.

As has been indicated, this argument is inconsistent with the theory, that in the case of a large property which has "struck its gait," most retirements equalize. It is proof that many of the railroads do not wish to equalize retirement, but wish instead to adjust them from year to year in accordance with financial needs. This method of absorbing the shock of revenue fluctuations is undesirable from many points of view. It certainly means loss of efficiency and economy in maintenance work. It is impossible, when expenditures change in this way, to have a stable force of men or to operate shops with maximum efficiency. The policy of protecting credit by manipulating maintenance expenditures is thus an uneconomic method. It also may be perilous to investors. Credit is protected by what amounts to a mispresentation of the facts. There is nothing on the face of the amounts to indicate, except by resort to extensive comparisons, that repairs or renewals have been deferred. Yet apparent net income is not protection to the investor if it be procured at the expense of upkeep. The deferring of proper maintenance may not be a serious matter if it be confined to a comparatively short period and if the deficiency be made good without undue delay. But extended over any length of time such practice invites disaster, and not infrequently investors have fallen victims to such disaster.

If depreciation accounting, properly supervised, has for its purpose an adequate record of the facts, as we believe to be the case, then it is difficult to justify a departure from this method for the sake of preserving credit. Clearly some better method of preserving credit, if it needs preserving, ought to be devised than one which accomplishes its results by an incomplete or imperfect record of the actual cost of operation. It seems true that the business and revenues of railroad companies are subject to wider fluctuations than in the case of telephone companies, and this may justify some difference of treatment. But such difference ought not to be made at the expense of a proper record of the facts. It is possible that this problem should be met by permitting railroad companies in prosperous years to create a reserve, limited in amount out of debits to operating revenue or income, which can be drawn upon in times of depression to augment revenue. However, this is a suggestion which obviously requires most careful consideration and, being outside the scope of these proceedings, it is not covered by the present record. We shall not undertake, therefore, to express an opinion upon it at this time.

5. It is contended that past experience has shown no need for a change in the practice of the railroads with respect to depreciation charges; that the policy of American railroads from the beginning has been to maintain their properties by the retirement method; and that it has not been shown that any disadvantage to shippers, investors or the public generally has resulted. Reference is made to *Advances in Rates—Western Case*,[7] where we said, at page 332:

> It is to be borne in mind that it has been American railroad policy to maintain the property fully, in a constantly improved condition, both as to road-bed and equipment, out of current revenue.

In considering this contention it should be borne in mind that, as has been indicated, many of the more prosperous carriers have in the past secured results equivalent in many respects to those which would flow from depreciation accounting, by charging additions and betterments to operating expense or by making similar expenditures out of apparent surplus. Many of the railroads have passed through all manners of vicissitudes. Receiverships and serious losses to investors have been frequent in the past. Deterioration of property and service has been a by-product. It would require a prolonged analysis of past records, if it be possible at all, to determine the extent to which a proper system of depreciation charges might by forewarning investors have encouraged and facilitated plans for the averting of disaster. In such cases there have generally been so many contributing causes, such as excessive capitalization, bad management, or unwise investments, that conclusions with respect to the relative influences of various factors would be difficult to draw.

However that may be, the fact is, as we shall later show, that reasons now exist which have not heretofore existed for distinguishing proper provision for depreciation from other means of protecting the property, such as accumulation or surplus or rebuilding or improvement programs under the guise of maintenance, and also for carefully limiting and supervising such

[7] 20 I.C.C. 307 (1911).

depreciation charges. There is nothing in past history which proves that depreciation accounting is unsound in principle or likely to produce harmful results. On the contrary, there is reason to believe that the railroads in the past that have best served the public and investors have been those which, in one form or another, have made provision for accruing depreciation.

6. It is claimed that if depreciation accounting is extended to cover all depreciable railroad property it will add so materially to operating expense that further increases in rates will be necessary. This contention, after all, begs the question. If depreciation accounting is a method by which the facts with respect to the cost of operating railroad and telephone companies are recorded with approximate accuracy, then that method should be adopted, regardless of its effect on rates. . . . The Interstate Commerce Act now provides, in section 15a, a rule for regulating the general level of railroad rates. . . . In order that these provisions of the law may be successfully administered, it is necessary to have an accounting system which will disclose as accurately as possible the actual cost of operation. This is necessary for the protection both of investors and of the public. If more be included in operating expense than ought to be there, the public will suffer. If less be included, investors will suffer. This brings depreciation expense to the forefront. If the railroad, gas and electric companies are correct in their contentions, then the present large amounts which are being charged each year for the depreciation of equipment and to some extent of fixed property ought to be eliminated from operating expense. And by the same reasoning the depreciation reserves for equipment which have been built up, amounting all told to more than one billion dollars, ought to be made a part of accumulated surplus available for declaration of dividends. On the other hand, if the telephone companies are correct in their contentions, then regular amounts should be included annually in operating expense, not only for depreciation of equipment but also for depreciation of many other kinds of steam railroad property for which such charges are not now accrued. And by the same reasoning the large amounts for the retirement of property which are included in operating expense in prosperous years and the lesser amounts which are included in years of depression should be eliminated and charged to the depreciation reserve. Moreover, if depreciation accounting be correct in principle, then the public regulating authority must be on its guard to prevent these charges from being made either smaller or larger than they ought reasonably

to be made. Obviously a need for exact accounting in this respect exists which has not heretofore existed, and this no doubt was recognized by Congress in the amendment to section 20 under which this proceeding was instituted.

Quite apart from this special need to which section 15a has given rise, there is a general need for accurate accounting as to operating costs which perhaps did not exist in the past or at least not to the same extent. In the early days of railroad construction and for many years thereafter, railroads were dealt with very much as other private industries, and they offered a field for large speculative profits. That day has gone by and the railroads are now confined, restricted, and supervised in almost every phase of their activities by public regulation. This regulation has eliminated much of the former risk of investment, but it has also eliminated much of the opportunity for large speculative profits. To attract investment under such circumstances the element of risk must be held within the closest possible limits, and this means careful provision against the uncertainties of the future. It also means a system of accounting which will disclose as nearly as possible the actual cost of operation which is presently being incurred, and which will reduce to a minimum the possibility of misleading investors by postponing to a later date the disclosure of any part of this cost. Nor does the need for such accounting exist only in the case of investors. The public served has an equal interest. In the old days of possible speculative profits the sequence of receiverships, reorganizations, and recoveries which so frequently occurred involved some temporary disturbance and impairment of service but no lasting injury, since new capital could be drawn without difficulty into the field which disaster had visited. It is doubtful whether disaster can be so easily repaired under present conditions. If the public is now to secure necessary extensions of service and to be in a position to reap the benefit of improvements in the art of railroading as they develop, reliance must be placed upon sound economy rather than upon speculation and chance.

In our opinion depreciation accounting satisfied the needs above set forth. The essential reason is that this method of accounting conforms with far greater accuracy than the retirement method to the actual facts with respect to operating costs. Neither investors nor the public are left in doubt in regard to the costs which are currently being incurred and ought currently to be met in the interest of prudent and sound economy. If these costs be met, the financial condition of the companies will be strengthened and they will be able to face the future with a greater degree of assurance. There will be no need for mortgaging the future to meet the debts of the past. Investors and the public generally will be protected against extreme fluctuations in operating expense and against an unnecessary large volume of outstanding securities demanding interest or dividend payments. Depreciation accounting, in short, conforms to the principles of conservative and constructive finance.

126. Sinking-Fund *v.* Straight-Line Method *

The fundamental difference between the sinking-fund and straight-line methods for figuring depreciation, has to do with the time element and the interest value of money.

> In the straight line method each year of service is considered to be of equal value to-day. In the sinking fund method we take cognizance of the fact that the year's service which we buy to-day, which will be delivered to us twenty . . . years from now, is worth only about 40 per cent as much to-day as a year's service which is to be delivered to us in the immediate next year. (Tr. p. 516; Av. p. 565.)

The adherents of the straight-line theory say, for example, that of two poles, one having an estimated life of ten years and the other an estimated life of twenty years, the former is worth just one-half as much as the latter; while the adherents of the sinking-fund theory say that the ten-year pole is worth more than one-half as much as the twenty-year pole, the exact ratio between the two depending upon the interest rate upon money. One way of defining the difference between the two theories is to say that the sinking-fund theory recognizes that invested money must earn interest in order that the investor may not suffer loss, while the straight-line theory ignores that fact. Another way is to say that, while under both theories it is admitted that at the moment of use equal services are equally valuable, under the sinking-fund theory it is held that a service due at a future time is less valuable now than the same services due at the present moment. A few simple illustrations will serve, we think, to demonstrate the soundness of the sinking-fund method and the fallacy of the straight-line method.

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* *In re Application 9767 of the City and County of San Francisco before the Railroad Commission of California* requesting the Commission to fix severance damages for certain portions of the Great Western Power Company's properties; initiated by the City February 11, 1924, decided June 17, 1929. [Decision 21247, 33 Calif. R.R. Com. Reports 202.] Excerpt from testimony of Mr. Thelen in Opening Brief of Owner and Claimants, pp. 196-198.

Suppose for instance, that a golfer, who regularly plays one game of golf each week, is offered the choice of either a fully paid ten-year membership in a golf club for the sum of $1000, with the privilege of extending his membership at the end of the ten-year period for another ten years for an additional sum of $1000, or a fully paid twenty-year membership for the sum of $2000; can he afford to accept the latter offer? Obviously not, for by so doing he would lose the interest on the second $1000 for the ten-year period first ensuing. Therefore, it is plain that the ten-year membership is worth to him today more than one-half as much as the twenty-year membership.

Assume, again, that I own two obligations, under one of which I am entitled to receive $100 per year for five years and under the other of which I am entitled to receive $100 per year for ten years. It is obvious that each $100 is worth precisely the same at the time of receipt; but it is equally obvious that at the present moment the several installments are progressively less valuable as their due dates are deferred and, consequently, the five-year obligation is now worth to me more than one-half as much as the ten-year obligation.

And so of two poles, one having an estimated life of five years and the other an estimated life of ten years, but otherwise being in all respects identical. The service rendered by either pole will be just as valuable to the owner as the service rendered by the other *at the time the service is rendered,* but, *at the present time,* the service to be rendered by the ten-year pole during the last five years of its life is worth less to the owner than the service to be rendered by it during the first five years of its life or the service to be rendered by the five-year pole during its full life. Therefore, it is certain that the five-year pole is worth more than twice as much as the ten-year pole. The sinking-fund method gives effect to that disproportionate relation between the value of short-life and long-life equipment; the straight-line method ignores it.

The foregoing examples illustrate the philosophy of the sinking-fund method. The mathematics of the method are somewhat less simple; which is probably the reason for the rejection of the method by several commissions and courts. A very simple concept has been obscured by the employment of the terminology of mathematicians.

127. Depreciation Allowance Methods *

Three methods of accounting for depreciation by annual allowances are:

1. Straight-line method.
2. Compound-interest method.
3. Sinking-fund method.

These names have reference not only to the accounting method, but also to the basis for estimating the amount of annual depreciation.

Under the straight-line method, it is assumed that depreciation grows directly with the service life of the unit or item that is depreciating; if its service life is half gone its value is half gone, etc.; if its total service life is estimated to be ten years, one-tenth of its value is assumed to disappear each year.

Under the compound interest method, the depreciation is assumed to grow at the same rate that an annuity grows that is sufficient to equal the cost of the depreciating item when it shall have served its full service life. If the life of the item is ten years and money is worth 6 per cent in the particular industry, then some particular amount placed at compound interest at 6 per cent at the end of each year will grow to the cost of the item in ten years. The annual growth of the sum of the annuity and interest, and the corresponding growth of depreciation is unequal year by year; it begins with a relatively small amount and ends with a relatively large amount. In the example given, the depreciation during the first year will be about 8⅓ per cent of the cost, and during the tenth year it will be a little less than 12 per cent of the cost.

Under the sinking-fund method, the same assumption of growth of depreciation is made as under the compound-interest method, but there is a different method of collecting the allowance. Only the necessary annuity is charged to the consumers; the interest which is necessary to the full growth of the depreciation annuity to an amount equal to the cost of the item is realized by investing the annuity paid by the consumers.

Of course, these assumptions of growth of depreciation or loss of value are purely arbitrary and are made in the beginning because no one knows how long a given item will last in service

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* Excerpts from William G. Raymond, *The Public and Its Utilities* (New York: John Wiley & Sons, Inc., 1925), Chaps. VI, VII, VIII, pp. 49-51, 56-58, 60-62, 65-67, and 70-71.

and some estimate is necessary in order that there may be some basis for the amounts to be entered in the accounts each year. An arbitrary sum differing from year to year could be allowed each year, and some concerns do just this, setting aside a large sum in years of prosperity in their business and a smaller sum in years of lesser earnings, and even omitting to make any allowance at all in years of adversity. Full safety of the investment and protection of that investment when a valuation is made, would seem to point to an annual allowance growing in some logical and defensible way as the wiser course for privately owned utilities, and equally wise when the public owns and operates.

Precision is not necessary. An item may give out some years before its estimated life is reached. In this case the remaining value not charged off, if not too large, may be charged off at once, and if so large as to disturb the uniformity of rates or profits, it may be amortized over whatever number of years may be necessary, even to continuing the regular allowances to the end of the estimated period unless by accident this period is too long. If the item overlives its estimated life, the setting aside of allowances for it may cease when its cost has been realized.

The Straight-Line Method. As has been stated, the straight-line method assumes that depreciation grows directly as the age of a depreciating unit in service years grows; when its life is half gone its value is half gone. In the accounts, then, if n is the estimated total service life of the unit in years, one nth of the cost will be charged each year to operating expense and credited to depreciation reserve. The total annual sum to be carried on account of the investment is interest on investment actually in the property and depreciation allowance. Each year the investment in the property is less by the amount of the depreciation; hence the interest is less each year, and the total necessary earnings for interest and depreciation seem to be less each year by the lessened amount of interest.

If the property is privately owned, the investor does not like to think that his investment is growing less year by year and he should not think so, because it is not growing less so long as the depreciation reserve is not returned to him but is kept for the property. The reserve is established for his protection, not for his harm. So long as the sum represented by the accrued depreciation is kept for the property, either as a fund to replace retired items or as reinvestments in extension to the original property, it should earn interest at the same rate as the remaining investment. If the sum is reinvested in the property to finance extension, just as soon as it is set aside and before it is needed to replace retired items, it will earn presumably, through rates for service, the same interest as the remaining investment. This means that at all times the total investment in the property will be the same, and equal to the original investment, until new capital is invested either to finance renewals of items whose costs, charged off from year to year, have gone into extension, or to finance other extensions. And this means that so far as the original investment is concerned, the interest or fair return item remains constant from year to year. . . .

A certain business begins January, 1900, with a single machine as its depreciable property. The machine has a service life of ten years, costs $1000, and has no salvage value. Each year a new machine is added at the same cost until ten machines have been installed, after which for a time there is no expansion. The

TABLE 66

Showing the Maintenance of the Growth of the Property Described in the Foregoing Paragraph, Using Depreciation Allowances for Part Payment

The quantities in the vertical columns show the depreciation allowances above the stepped line and the new capital required for each machine below the stepped line. Depreciation by the straight line method.

Machine	Jan. 1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	
1	$1000	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	
2		$900	100	100	100	100	100	100	100	100	100	etc.
3			$800	100	100	100	100	100	100	100	100	etc.
4				$700	100	100	100	100	100	100	100	etc.
5					$600	100	100	100	100	100	100	etc.
6						$500	100	100	100	100	100	etc.
7							$400	100	100	100	100	etc.
8								$300	100	100	100	etc.
9									$200	100	100	etc.
10										$100	100	etc.
To replace Machine No. 1 no new capital												etc.
Total	One Thousand Dollars in Each Column											
New Cap'l	$1000	900	800	700	600	500	400	300	200	100		= $5500

depreciation allowance on the first machine is $100 a year and is immediately reinvested in the property in the purchase price of the new machine, so that the machine purchased the second year requires only $900 of new capital. The second machine has the same amount of depreciation similarly reinvested, so that the purchase of the third machine requires only $800 of new capital. For each succeeding year the contributions to depreciation reserve, reinvested in the property, and the new capital required are shown in Table 66 opposite.

The total shows that $5500 of new capital has purchased $10,000 worth of machines, and that the accruing depreciation of the tenth year and subsequent years will just add one new machine each year to replace the one retired under the conditions of the hypothetical case. An inventory of the property made at the beginning of any year will show a remaining cost in the property equivalent to just the amount of new capital that has been invested. Thus at the beginning of the seventh year the situation will be as follows:

TABLE 67

ACCRUED DEPRECIATION

	COST	LESS DEPRECIATION	REMAINING COST	NEW CAPITAL
Machine No. 1.........	$1000	$ 600	$ 400	$1000
" " 2.........	1000	500	500	900
" " 3.........	1000	400	600	800
" " 4.........	1000	300	700	700
" " 5.........	1000	200	800	600
" " 6.........	1000	100	900	500
" " 7.........	1000	000	1000	400
	$7000	$2800	$4900	$4900

At the end of the seventh year just before the depreciation entries have been made the remaining cost and new capital will be the same as given in the table. Immediately after making the depreciation entries and before the purchase of a new machine, the new capital will appear to be $700 more than the remaining cost, but this $700 will be in hand, accounted for in operating expense and depreciation reserve to apply on the next purchase, and to be counted as capital assets to bring the inventory to a sum equal to the new capital invested.

The Compound-Interest Method. As has been stated, the compound-interest method of accounting for depreciation assumes that the depreciation grows just as an annuity grows at some fixed rate of compound interest. Thus if an item of property costs \$1000 and has a life of ten years and if an annuity of A dollars is to be placed at 4 per cent compound interest to equal the cost of the item in the ten years, so that when the item is retired a sum equivalent to its cost will be in hand to reimburse the owners for the consumption of capital assets that has gone into the service, the depreciation of the item at any time is assumed to be equivalent to the accumulated annuities and interest. In the example cited for illustration the value of A is \$83.29 found by substituting in the formula.

$$A = \frac{Cr}{(1+r)^n - 1},$$

in which A is the annuity in dollars, C is the cost of the item in dollars, r is the interest rate in dollars = \$0.04 in this case, and n is the life of the item or number of years in which the annuity is to mature to the cost, C. The accumulation, or sum, S, of this annuity with its interest at the end of n years is found from the formula:

$$S = \frac{C\ [(1+r)^m - 1]}{(1+r)^n - 1}$$

Tables of A and S are printed and can be had in various books on accounting or valuation.[1]

The allowances from year to year are unequal, growing each year by the interest on the preceding accumulations; but if the interest rate assumed is the same as that to be earned by the invested capital, the sum of interest on the remaining investment and depreciation allowances is the same from year to year. Thus for the example given, the collection of interest and depreciation allowance, if the interest rates are the same, will be as in Table 68.

If the interest rate is 8 per cent and the depreciation rate is 4 per cent as above, the sum of annual interest and depreciation allowance will not be the same through the years. The interest would be 8 per cent of \$1000 or \$80 the first year, making the total \$186.29 and it would be 8 per cent of \$118.55, or \$9.48 the last year, making the total payment \$128.03. For this reason

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[1] See Report of Special Committee of American Society of Civil Engineers "Valuation of Railway and Other Public Utilities," *Transactions American Society of Civil Engineers*, LXXXI (December, 1917), 1540. See also C. E. Grunsky, *Valuation, Depreciation and Rate Base* (New York: John Wiley & Sons, Inc., 1927), p. 317.

TABLE 68

Remaining Cost, Interest at 4 per Cent, and Depreciation Allowances for an Item Costing $1000 and Having a Service Life of Ten Years Without Salvage Value

Depreciation accumulations at 4 per cent. Figures show quantities as they are at the ends of the years, remaining cost given as after the deduction of the year's allowance for depreciation.

1 Year	Remaining Cost	Interest	Depreciation Allowance	Total Interest and Depreciation Allowance
Beginning of year 1..	$1000.00	$ 0.00	$ 0.00	$ 0.00
Year 1..............	916.71	40.00	83.29	123.29
" 2..............	830.09	36.67	86.62	123.29
" 3..............	740.00	23.20	90.09	123.29
" 4..............	626.31	29.60	93.69	123.29
" 5..............	548.87	25.85	97.44	123.29
" 6..............	447.53	21.95	101.34	123.29
" 7..............	342.14	17.90	105.39	123.29
" 8..............	232.54	13.69	109.60	123.29
" 9..............	118.55	9.30	113.99	123.29
" 10..............	0.00	4.74	118.55	123.29
			$1000.00	

it is considered good policy to compute depreciation allowances with an assumed interest rate equal to the required rate on the investment. All this seems quite convenient from the standpoint of the consumer because that part of his rate for service that pays interest and depreciation is the same from year to year. But, as in the straight line method, the owner does not like to think of diminishing investment return when he has a constant sum kept in or for the property. Therefore, the depreciation allowances should earn at the same rate as the remaining investment. This may be brought about by reinvesting the depreciation allowances in the property when practicable or by investing them in quick-moving securities or placing them in bank at interest. If they are not invested in the property the interest rate that can be secured is likely to be less than is required by a public plant maintaining its debt, and less than the fair rate of return to a private owner. The difference should be charged in operating expense and so collected from the consumers. The better way is to charge full return on undepreciated property and credit operating expense with interest earned on outside investments. . . .

The Sinking-Fund Method. The sinking-fund method is a special case of the compound-interest method. The depreciation is assumed to grow just as in that method; but the consumers, instead of paying the necessary annuity and interest amounting to the whole depreciation, pay only the annuity. The owner is required to reinvest these annuities at some rate of interest, presumably that used in computing the annuity. In order that a sum equivalent to the cost of a given item shall be in hand when the item is retired, the annuities for that item with the accumulations of interest must be kept as a fund called the sinking fund, an asset of the property. At all times this fund and the depreciated cost of the item will be equivalent to the original cost. The whole cost of the item being always kept in the property as physical property or fund, the interest to be earned in rates at all times is the required rate, if a public property, and the fair rate of return if a private property, on the whole cost. The total payment of consumers for interest and depreciation will be the same from year to year and will be exactly the same as under the compound interest method of accounting. The following table shows this:

TABLE 69

SHOWING REMAINING COST, GROWTH OF SINKING FUND AT 4 PER CENT, TOTAL COST IN PROPERTY AND FUND, YEARLY INTEREST ON TOTAL COST, AT 4 PER CENT, ANNUITY TO SINKING FUND, AND TOTAL ANNUAL PAYMENTS OF CONSUMERS ON ACCOUNT OF INTEREST AND ANNUITY

Cost of item $1000. Life ten years.

	REMAINING COST IN PHYSICAL ITEM	SINKING FUND		TOTAL COST IN PROP. AND FUND	INT. ON COST IN PROP. AND FUND	ANNUITY TO FUND	TOTAL PAYMENT INTEREST AND ANNUITY
		Yearly Addition	Total				
Beginning of year 1 ...	$1000.00			$1000.00	....	....	.....
End of year 1 ...	916.71	$ 83.29	$ 83.29	1000.00	$40.00	$83.29	$123.29
" 2 ...	830.09	86.62	169.91	1000.00	40.00	83.29	123.29
" 3 ...	740.00	90.09	260.00	1000.00	40.00	83.29	123.29
" 4 ...	646.31	93.69	353.69	1000.00	40.00	83.29	123.29
" 5 ...	548.87	97.44	451.13	1000.00	40.00	83.29	123.29
" 6 ...	447.53	101.34	552.47	1000.00	40.00	83.29	123.29
" 7 ...	342.14	105.39	657.86	1000.00	40.00	83.29	123.29
" 8 ...	232.54	109.60	767.46	1000.00	40.00	83.29	123.29
" 9 ...	118.55	113.99	881.45	1000.00	40.00	83.29	123.29
" 10 ...	0.00	118.55	1000.00	1000.00	40.00	83.29	123.29

It should be plain that although the interest or return rate may be different from that used in computing the sinking-fund annuity, nevertheless, the total yearly payments of consumers on account of interest and depreciation allowance will be the same from year to year. Thus, if the interest rate were 8 per cent, the annual interest payment would be $80 instead of $40 and the total payments would be $163.29 each year. In this respect this method differs from the general case of compound-interest method. This method provides for a full return to the owner on the whole cost and a proper allowance for depreciation, and a uniform charge to the consumer for these two items combined. . . .

When the sinking-fund method is used, the annuity should be computed for an interest rate as nearly as may be the same as that which it seems probable that the fund will earn. The fund cannot be used for additions or extensions, because if it is so used it must earn its growth interest in the rates for service and the result at once is the general compound-interest method. The sinking-fund method contemplates the establishment and maintenance of a fund by contributions of annuities in rates for service and interest growth outside the property.

Reserve Methods. Some enterprises use a reserve method that is different from either of those described. An arbitrary sum, depending on the earnings of the property, is set aside for depreciation from month to month, or year to year. In a good season a larger sum is charged off or to a reserve; in a poor season a smaller sum, or nothing, is so charged. This is an unwise procedure, which may sacrifice the property to uniform dividends. The better way is to create a surplus out of earnings, if possible, with which to make distributed net earnings uniform. If the property is owned by the public there will be no dividends or net earnings to maintain, but a reasonable surplus from which to draw for accidents or emergencies is desirable.

Experience may show that an annual or monthly charge of so many cents per thousand feet of gas sold, or a small fraction of a cent per kilowatt of energy sold, or per thousand gallons of water pumped, will care for all depreciation requirements in these respective industries. This is simply the application of something like the straight line method of depreciation accounting, but it has, perhaps, one advantage in that it recognizes that depreciation is more likely to proceed in proportion to quantity of service than to the years of service. If it is based on sufficiently extensive experience it will make a very simple and satisfactory method. The accounting entries will be as for the straight line method except as to the amounts of the entries. These will be the same, of course, for those entries required to record the retirement and replacement of items.

It is common to charge depreciation on the property as a whole, but to arrive at the whole depreciation charge it is desirable to consider different classes of items separately. Thus in a waterworks property, the distribution system will have one rate of depreciation, the pumping machinery another, the boiler plant another, and the buildings another. The total depreciation charge will be the sum of the parts. This may be expressed as a percentage of the whole property or kept simply as a sum recomputed each period.

CHAPTER XII

CAPITAL AND CAPITALIZATION

128. Relation of Capital to Capitalization *

Banks are constantly requested to grant loans to public utilities, in large or small amounts. The first question asked of any borrower is "What security have you?" Security depends on value, hence bankers are intimately concerned with getting the exact value of the property on which they are expected to loan money.

But, in public utilities, the banker cannot apply his usual method of valuation. That is, he cannot calculate the value of a public utility property from its earning power as he does in the case of an industrial corporation. For the earning power of a public utility must be based upon its valuation, and not value upon earnings. The process is reversed.

It is impossible for the banker to ask for a record of income statements of the utility for a number of years, and then base his loan to the utility on the assumption that, other things being equal, the earnings will continue much the same. For if the valuation on which the utility is earning this return is false, it is almost certain to be discovered by the public utility commission sooner or later, and upset.

Nor can the banker use the other familiar method of estimating the value of the utility from its total capitalization on the theory that capitalization represents money which has actually gone into the property. For in many cases in the past, especially in connection with public utilities, a large part of the capitalization represents merely water. The great utilities have grown up through the consolidation of many small individual utilities, and in almost every case, when a small company was absorbed, some securities were issued in payment for its good-will, which usually has no tangible value. The public utility commissions will not allow a return on such fictitious "value" if they discover it to be fictitious and can prove so.

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* By Harold A. Danne, "Valuation of Public Utilities from a Banking Standpoint," *Banker's Magazine.* CXI (August, 1925), 247-8.

The only safe basis then on which a loan to a public utility can be made is on the basis of "the total value to the owners of the property at a certain date and place," or, in other words "an engineering estimate of the amount of bona fide capital still remaining in the property, or of the cost of reproduction under existing conditions, less depreciation."

This estimate is complicated by the fact that in many cases accurate records of the cost of the property have not been kept and often those which have been kept show inflated costs. It is further complicated by the fact that the very rapid growth and improvement of the electrical industry in the last twenty years has caused so many changes and additions to the property. In the past such properties as power utilities have grown like a tree in spring, and are still growing if they are in a progressive city. Very often additions come into existence in so casual a manner that one can scarcely believe it unless he has seen the vital necessities that have created the growth. Machines have been brought in, which were capable of lasting for twenty years, only to be replaced within five years by a more efficient machine which has just been developed, and which must be used if the utility is to keep its competitive position. Even though the utility have a monopoly on the region, it must keep its machinery up to date, otherwise it becomes more profitable for large manufacturing plants, who were accustomed to buy their electric power from the utility, to install new machinery for themselves and generate their own power. The bearing of this on valuation is to point out the difficulties of correctly valuing such obsolete machinery, and other machinery, still being used, but depreciating at an abnormal rate because of obsolescence.

This situation has contributed, too, to the pressure for new capital which makes valuation so necessary, for the public utility commissions refuse to allow public utilities to earn more than a "fair return" and make no provision for additions, extensions, and betterments. It being impossible to make necessary extensions out of earnings, capital must be secured from investors, who insist on knowing the value of the property in which they put their money.

The valuation of a public utility property, then, involves an engineering estimate of the cost of the property, based on the original cost of the units, less depreciation; an engineering estimate of the reproduction cost of the present day equipment at present day prices, less depreciation; a consideration of the intangible values, such as developmental expenses, the value of the franchise, and good-will; and finally an attempt to evaluate the "going-concern value," that is to say, "The added value of the plant as a whole over the sum of the values of its component parts, attached to it because it is in successful operation and earning a return." All these must be taken into account in the valuation of any public utility. . . .

129. What Is a Good Capital Structure?

A.* It is reported that securities which are protected by earnings after taxes and depreciation of more than twice the amount necessary to pay annual requirements do not bring, in the investment market, a price proportionately higher than do securities protected by approximately twice the necessary earnings. On the other hand, securities which are protected by less than twice the necessary earnings are sold at a proportionately serious disadvantage. Other things being equal, that company pays the cheapest price for its capital which, after providing for all contingencies, taxes, and depreciation, earns its fixed charges and preferred dividends exactly twice over.[1] Judged by investment market sentiment, therefore, a good capital structure permits no more and no less *net* earnings than twice the interest on bonds and the preferred dividends.

The financial plan based on this theory includes common stock, preferred stock, and bonds. The bonds should be limited in amount so that their interest charges are equal to one-half of the earnings available after taxes and depreciation. The preferred stock should be sufficient to absorb one-half of the remaining earnings.

B.† While we find limits as to the proportion of bonds to stock, broad limits in the statutes, and often narrower limits in the requirements of banks, it cannot be said that in any given case the proportion should be a definite percentage, although it is well to have limits in mind beyond which, as a general proposition, it is not desirable to go. So we may fix a rough limit of 66⅔ per cent of bonds and 33⅓ per cent of stock, or vice versa 33⅓ per cent of bonds to 66⅔ per cent of stock. Somewhere within these limits will be found the desirable proportion in any given case.

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* Excerpt from H. P. Bruner, "Influence of Customer Ownership on the Financial Structure of Public Utilities," *Journal of Land and Public Utility Economics*, I (1925), 459-460.

† Excerpt from S. T. Bodine, *American Gas Journal*, CXXII (1925), 104.

[1] This is the general theory underlying the financial structure as proposed by Arthur Stone Dewing. See A. S. Dewing, *Financial Policy of Corporations*, (New York: The Ronald Press, 1921), Vol. II, Chap. V.

An important consideration in determining the amount of bonds and stock to be issued is that, due to the greater security, money obtained through the sale of bonds is cheaper than money obtained through the sale of stock, the difference being anywhere from 1 per cent to 2 per cent per annum. As a public utility has a relatively large amount of capital in proportion to the income it produces, its capital is turned over relatively slowly, once in three to five years, whereas an industrial may turn over its capital as rapidly as several times a year. This means that an additional cost of 2 per cent (2 cents) per annum for each dollar of capital will cost a utility on the average of 8 cents additional. For instance, assuming the company sells its securities at par, money raised through the sale of 5 per cent bonds costs the company 20 cents for each dollar obtained (5 cents a year for four years), whereas money raised through the sale of 7 per cent preferred stock would cost in carrying charges 28 cents for each dollar obtained (7 cents a year for four years). You will see that is an item that must be reckoned with.

Summing up the proportion of bonds to stock, it might be said that the ideal relationship is that which allows the corporation to apportion its earnings so that it is possible to maintain the highest degree of credit and at the same time pay adequate dividends to its stockholders and retain a working surplus. . . .

130. Some Tests of a Good Utility Security

A.* As a guide for the ever-increasing number of utility-security purchasers, a large investment house has recently drawn up a group of eleven tests for a utility bond. . . .

1. The company's right to operate its property should extend beyond the life of the bond, or should be indeterminate.
2. The utility should be free from competition.
3. The company should have satisfactory public relations and competent management.
4. It should have customer-ownership of its preferred stock.
5. The territory served should be prosperous and growing both in population and in industry.

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* From *Electrical World*, LXXXVIII (1925), 957.

6. Earnings should show an increase in gross and net for a period of years.
7. Interest charges should be earned twice before depreciation.
8. Bonded debt should not exceed 80 per cent of property value.
9. Bonded debt should not exceed five times gross earnings.
10. Property should be adequately maintained with combined maintenance and depreciation not less than 12 per cent of gross earnings.
11. The company's main vehicle of financing should be a modern mortgage with issuance of additional bonds restricted to 80 per cent of the cost of additions to property and allowable only when interest charges are earned twice.

B.† The issue of the *Electrical World* for November 7th contains . . . a brief article on "Eleven Tests of a Good Utility Security." . . .

Several of these tests are not consistent with standards which have substantial recognition, being either too strict or too liberal. I am, therefore, taking the liberty of giving you the following comments covering what appear to be deficiencies in these tests, attaching to the comments the numbers by which the tests given in the article are designated:

1. Although franchise rights are still important and should ordinarily extend beyond the life of a bond, where regulation exists and certificates of public convenience and necessity are required before public service can be undertaken, and existing public utilities are otherwise protected, the term of the franchise is not vitally important. This is obviously the case in connection with bonds issued under an open-end mortgage, which may run far beyond the life of existing franchises.

4. It is not necessary for the safety of the utility bond that the preferred stock of the issuing company should be owned by its customers. Such ownership is conducive to satisfactory public relations and competent management . . . but if such relations and management exist without customer ownership, the bondholder is reasonably protected. . . .

7. The rule that interest charges should be earned twice before depreciation is a common one and reasonably safe for the conventional financial structure. It is, however, not always depend-

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† Letter of L. R. Nash, Vice-President Operating Division, Stone & Webster, Inc., Boston, Mass., to the editor of the *Electrical World* (November 28, 1925).

able. If the capitalization is low in relation to earnings or the bond issue is a small proportion of the total capitalization, the margin over bond interest required by this test may be a dangerously small percentage of the gross earnings, and this margin might be wiped out under unfavorable business conditions. . . . A more logical alternative, (is) that the margin after bond interest but before depreciation should be 20 per cent of the revenues for the corresponding period.

9. A provision that bonded debt should not exceed five times the gross earnings involves no protection to the bondholder of a normal property, which should have a total investment less than five times such gross earnings. Obviously, if the bonded debt is kept below 80 per cent of the property value, as proposed in (8), the ratio of this debt to gross earnings should be much less than five times, except in the case of hydro-electric or other unusual properties. . . . The writer (suggests) an alternative test, namely, that the bond issue should not exceed six times the net earnings before depreciation or seven and a half times net earnings after depreciation. Such a test applies only to utilities with normal capital structures.

10. Twelve per cent of the gross earnings of a normal utility property is not sufficient to take care of combined maintenance and depreciation. This percentage should be increased by something like 50 per cent to take care of electric property and substantially more than 50 per cent for a railway property. . . .

It is not practicable to apply any fixed rules to utility investments without discrimination. The history and character of a property and other pertinent factors should be known and suitable allowance therefore made before applying any specific tests. It is even then wise to have one's judgment confirmed by the opinion of a responsible investment banker.

131. The Financial Structure *

The average financial structure is based on the principle of borrowing from 50 to 75 per cent of the money necessary, and then dividing the owners into two classes, the first of which takes its dividends before the second class and in return agrees to a limited dividend rate. To those who lend money to the company bonds are issued, sometimes secured by mortgage, then

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* Excerpts from H. V. Bozell, "Where the Money Comes from for Light and Power Financing," *National Electric Light Association Bulletin*, XIII (1926), 101-105.

known as mortgage bonds, sometimes unsecured, being in the nature of notes, and known as debenture bonds, or merely debentures. To the first class of owners, ''preferred'' stock is issued, and to the second class of owners, who take the real risk of the business and to whom is usually, therefore, given the voting power and consequent responsibility of management, ''common'' stock is issued.

Looked at from the standpoint of ''safety,'' which is to say assurance of continuation of interest or dividends, and assurance of return or recapture of the money invested, these securities naturally come in the following order: Bonds, debentures, preferred stock, and common stock. And consequently, return on the capital to these different classes of investors is in inverse ratio to the safety of their investment, bonds receiving the lowest and common stock, if the company is successful, the highest. But it is well to remember that if the company is not successful, if it suffers from a business depression—high coal costs, if a steam company; a low water year, if a hydro-electric company,—the common stock may get the lowest return, or none at all.

Those are comparatively simple, generally known facts, and the general theory of such a financial structure is common to most business. But I mention these facts to emphasize that these different classes of securities, the total return on which is generally under regulation, allowed to be no more than 8 per cent of the value of the property, appeal to different classes of investors and different sources of money. Properly to balance these to attract money to the industry, with the variations in general prosperity of the country, money supply, etc., is part of the financial problem of the industry.

Open-End Mortgages. It is worthy of note that practically every contestant who made any particular contribution to a financial discussion commented upon the effectiveness of the open-end mortgage in strengthening the financial structure of the light and power industry and in fitting it better to meet the needs of an industry which is growing so rapidly. In a few words, earlier practice was to borrow money and, for security, to place a first mortgage on the property of a company. For example, a $600,000 mortgage on a $1,000,000 property, just as a man mortgages a $20,000 house for, say, $10,000. If it became necessary to add to the property, all additions also became subject to the mortgage, and the mortgage could be increased only by issuing a new one, which many holders said impaired their security and consequently the company was seriously hampered. Even if the mortgage were limited to the property on which it was originally placed, new mortgages could be issued only on additional property. This was both complicated and costly and quite frequently prohibitive. When the open-end mortgage was created its effect was to place this same $600,000 mortgage on a million dollars' worth of property, but with the provision that if the property were added to bonds could be issued under this same mortgage in the same proportion to property value, or with the same relation to earnings value. To anyone who recognizes the necessarily rapidly growing nature of the light and power industry the value of this type of mortgage is immediately apparent. That this advantage is not theoretical is fully evident from the results which have been obtained with it, and from its rapidly increasing use since its introduction. . . .

The fact that low bond rates like the 4½ per cent mortgage of the Commonwealth Edison Co. can be secured is in itself proof that the sources of this kind of money are satisfied with the degree of safety which light and power mortgage bonds give, and, what is perhaps saying the same thing another way, with the continued stability of earnings in their relation to bond interest requirements. . . . Also, other factors, such as increased age itself and therefore better knowledge about the industry on the part of the public, together with provisions allowing institutions, banks and trust funds to invest in public utility securities will tend to reduce even below the present level the interest rate required on light and power mortgage bonds.

Debentures. With reference to the use of debentures, that is, unsecured loans, this type of security has proved very popular in the last two or three years and is always attractive to money in what is known as an easy money market. A debenture, of course, has the attraction of a higher interest rate to offset what might be termed, particularly from a legal standpoint, less safety of principal than carried by a mortgage bond. However, on account of the almost perfect record of electric light and power companies in paying dividends on stock, which, of course, cannot be paid until after debenture interest is paid, debenture issues on operating companies in the light and power industry are considered so safe that such as educational institutions, industrial companies with large surpluses, and insurance companies, are attracted on account of the higher return. The debenture also attracts a great deal of money from private investors who wish a safe and assured long-term investment which usually is readily marketable. One of the strengthening features of the financial situation of a large number of light and power companies is that they have issued debentures during a time when money was easy, being thus fortified to issue mortgage bonds on the property in times when money in the general market might be more difficult to secure. These debentures . . . should not be confused with the debentures of holding companies. . . .

Preferred Stock. Preferred stock carries ownership and gives a higher yield, guaranteed before common dividends are declared, than either bonds or debentures. Preferred stocks were in the earlier days sold principally through the investment market and usually to large holders, that is, the purchasers of large blocks. About 1920, however, the light and power industry, starting in California, took cognizance of the thrift and investing habits of the American public developed during the Liberty Loan drives and has sold large amounts of preferred stock to which it has given the name "customer ownership" preferred stock, to customers in the territories served. The light and power industry is adding customer owners at the rate of approximately 250,000 a year at the present time. . . . There is some debate as to whether this rate of increase of customer owners can be maintained, but there is no doubt that customer ownership will continue to play a very real part in the distribution of preferred shares and the consequent investing of the communities' savings in comparatively small amounts in the light and power companies of the immediate communities. The effect of this is much more widespread than the mere obtaining of the substantial but comparatively small amount of money derived from the sale of this stock. It not only provides a large element of junior money, but it also creates a community of interest between the utility company and its customers which did not theretofore exist, which in turn tends to create a great deal of confidence in any situation of that particular sort in the general financial markets of the country.

In addition to the customer-ownership preferred stock, there are also large quantities of preferred stocks in demand in the general investing market. These are now selling on a basis sometimes as low as 6 per cent and usually not over 7 per cent. There is a growing opinion among financial students, reflected specifically by many of the essayists in the contest, that by 1930 most preferred stocks of utility companies will be on no more than a 6 per cent basis. . . . An analysis made by our company a couple of years ago and brought up-to-date recently, including the preferred stock dividends record of all light and power companies having a gross of a million and a half or over, showed that there is not a single one of them with unpaid preferred stock dividends.

. . . It is very interesting to note that the more astute insurance companies and educational institutions, with this record of continued financial stability of preferred stocks in their minds, are purchasing these stocks in large blocks. And they are, furthermore, a very popular form of purchase in small blocks for the individual investor of comparatively small means. It is surprising today to see the speed with which issues of preferred stocks of light and power companies are absorbed in 5- to 50-share lots by the average investor.

Common Stock. Common stocks are, of course, more variable in their appeal to the general public. Their appeal depends a great deal on the general prosperity of the country, and a study would show that common stocks are purchased in what are termed ''waves'' of public popularity. There is, of course, some speculation in common stocks by the speculating public, but on the whole common stocks are purchased by individuals or by corporations whose resources are such that they can forego dividends in years when earnings may not be so good—in other words, by those who can afford to risk the variations of earnings which are naturally incident to common stock ownership.

In this connection the holding company should be referred to because of its peculiar usefulness from a financial standpoint.

Common stock money is the prime essential to any financial structure. Without some money to take the risk of the business, to stand the ups and downs of earnings, it is impossible to secure money by the sale of preferred stocks or of bonds. The ''nest egg'' must be there to start with. But on account of the variations in earnings, and because of the obligation, in a business which is compelled to grow and add to its capital, to continue to put common stock money into the property, it is not always possible to sell common stock of operating companies in the general market.

The Holding Company. Such a company is, essentially, one which owns all or a large proportion of the common stock of a diversified group of operating companies. On account of the diversification of its holdings, the income from all of them, when added together, is stable even though there may be variations up and down in the earnings of the various subsidiary companies. To the engineering mind this might be most easily likened to the comparatively smooth load-curve on a power plant obtained when it is supplying energy to a large number of different kinds of load, each with its own large peaks, but, on account of the diversification, all producing a more nearly constant load-curve on the plant as a whole. The holding company, with its larger resources and with its earnings independent of smaller fluctuations, can supply money necessary for upbuilding properties in the way of temporary loans when it might not be feasible for the underlying companies to float their own securities in sufficient amount, and thus makes possible in a short period a development which would otherwise take many times as long to effect.

Thus, a holding company does, financially, two things—it provides diversification of risk in obtaining the common stock money for light and power companies, and it also makes temporary loans or advances out of the common pocketbook, to the newer or underdeveloped members of the family, until they can grow to a point that they can finance themselves at reasonable cost. Of course, the holding company is also in a position to render many corollary services, such as expert supervision of management and engineering, which in turn result in great economies of operation, as well as in increase in reliability of service.

Then, finally, you will say, where will the holding company get its money? Because of the assurance of income from the well diversified holdings it can borrow about half of it, for which it issues debentures. For the other half it must depend on its own members and the general public, dividing these owners again into two classes, preferred stockholders and common stockholders. Holding company debentures have also been proving very popular in the last two or three years both to some of the institutional investors who have the facilities for careful investigation and to a very large number of the investors among the general public. Debentures for as long a term as a hundred years have been readily marketed for some of the more substantial holding companies. It is interesting to note that the preferred stock of holding companies of the more substantial class is marketed with almost the same ease, and is absorbed with almost the same rapidity as the preferred stock of the operating companies. As stated above, the buyers of this class of stock are largely the general public, and it is issued today usually on a 7 per cent basis or more. Common stocks of holding companies seem to have a very wide appeal particularly in the last few years since public utilities have been recognized at least partly for their true worth. It is natural that such common stocks are bought more eagerly in times such as we have had the past two years when there has been plenty of money in the country, but there is nearly always a real market among those who are careful enough to study the situations carefully.

Lest someone get the notion that the name "holding company" is in itself a guaranty of stability I want to emphasize that constructive creations to accomplish worthy purposes may sometimes be used by imitators. Thus particularly in a market where money is so free, we have seen in the past two or three years some holding companies making rapid expansions through the sale of their securities, some of which have not been considered by the industry as a whole to have been issued on a sufficiently conservative basis. But no one need fear for himself if he makes adequate study or seeks dependable advice with reference to any of his own purchases of such securities. . . .

Ability to Attract Money. . . . What I would emphasize is that the light and power industry has so constructed the financial structure of both its operating companies and its holding companies that it is in a position to attract money to its various classes of securities in necessary amounts, at that particular time. During the past two or three years it has wisely, through its holding companies and through the junior securities of its operating companies, obtained large amounts of junior money with which it has developed its physical plant, and it will doubtless continue that policy in any time of so-called easy money, thus fortifying itself doubly for times of possible national depression, when it will have plenty of leeway to secure money on its senior or mortgage issues.

132. The Effect of Capitalization on Rates and Service *

Governmental control of railroad securities is favored as a necessary protection both to the investor and to the public. Obviously, however, the public interest is paramount. . . . What the public demands of the railways is the best possible service at the lowest possible rates. Its chief concern in the regulation of railway securities must lie, therefore, in the possible effect of capitalization on rates and on service.

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* Excerpts from J. C. Bonbright, *Railroad Capitalization*, Columbia University Studies in History, Economics and Public Law, Vol. XCV, No. 1, (New York: Longmans, Green & Co., 1920), Chaps. I and II.

Very unfortunate has been the tendency in public discussion of railroad problems to emphasize the problem of rates to the exclusion of the problem of service. With respect to capitalization this tendency is particularly to be deplored, for the financial structure of railway corporations has a much more decided influence upon the quality of the service than upon the rate level.[1] . . . It is nevertheless true that capitalization does have some effect on rates as well as on service. . . .

EFFECT OF CAPITALIZATION ON RATES

No railway problem has given rise to more dispute, or to greater extremes of opinion, than the question of the relation between the amount of outstanding securities and the transportation charges.[2] Transportation rates are usually determined, in the first instance, by the railway management; but they are subject to approval or revision by government, either through legislation or, more frequently, by order of a regulating commission. In our study of the effect of capitalization on rates we must look, then, on the one hand to the voluntary rate policy of the railway management and, on the other hand, to the principles of rate control by government.

Influence of Capitalization on a Company's Own Rate Policy. It is often assumed in popular discussions that railways and public utilities fix such rates as will enable them to earn interest and dividends on outstanding securities. From this is would follow, of course, that an excessive issue of stocks or bonds would result in excessive rates. Obviously, however, this assumption is fallacious; corporations are neither able nor willing to adjust their charges on any such basis. Their attempt is to secure a maximum profit, whether that be 2 per cent or 20 per cent on the stock. Charges are limited, either to the rates on competitive lines, or to so-called "monopoly price," based on the principle of "charging what the traffic will bear." A railway might double its capitalization, but it could not thereby stop competition nor increase the capacity of the traffic to bear higher rates. . . .

This conclusion, that increased capitalization would not cause a railway management to raise the rates, is subject to one qualification long ago pointed out by Hadley.[3] When a company is so overcapitalized that it finds difficulty in earning the expected rates of interest and dividend, it may resort to a short-sighted policy of rate-making in order to secure the earnings for the sake of an ultimate gain. Conversely, where a prosperous railway would hesitate to raise rates for fear of injury in the long run to its traffic, the impecunious road would stop at nothing that might bring a temporary increase in its earnings. Perhaps one may state the point formally in this way: The policy of any corporate monopoly with respect to charges (and services) is dictated by two considerations—first, by the desire to make maximum profits in the long run; second, by the desire to avoid even a temporary fall in profits below a certain minimum. Sometimes these two considerations conflict; and when they do conflict, the first usually predominates with financially strong companies,[4] the second predominates with financially weak companies. . . .

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[1] S. O. Dunn, *Regulation of Railways* (New York, D. Appleton & Co., 1918), p. 136; W. Z. Ripley, *Railroads, Finance and Organization* (New York, Longmans, Green & Co., 1915).

[2] Statement of R. S. Lovett before the Railroad Securities Commission, New York, December 21, 1910.

[3] *Railroad Transportation* (New York, 1885), pp. 122-24. In theory there is another qualification; namely, that capitalization may affect rates by

The very reasons that may induce an overcapitalized monopolistic railway to raise its rates may cause an overcapitalized competitive railway to lower them. In both cases the shortsighted desire to secure maximum immediate returns prevails. But in the one case this object would be attained by charging all that the present traffic will bear, while in the other case it would be attained by lowering rates so as to undercut competitors.

Our conclusions, then, as to the effect of capitalization on rates, when these rates are fixed by the railways themselves, is that some relation may exist, but that this relation is much less direct and of much less significance than is generally assumed in popular discussion.

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influencing the amount of construction of competitive railways, thus increasing or decreasing the opportunities to charge monopoly prices. Strangely enough, writers have taken opposite views as to the effect of overcapitalization on competition. Some have held that it tends to stimulate competition by making the overweighted company less strong and formidable as a commercial fighter (E. S. Mead, *Corporation Finance* (New York: D. Appleton & Co., 1915), p. 149; Henry Clews, *Fifty Years in Wall Street* (New York: Irving Publishing Co., 1908), p. 247). Others have contended that the concealment of profits by means of stock-watering tends to deter possible competitors. Of these two positions, the latter is the more plausible. It is strengthened by a further consideration: that overcapitalization, by contributing to railway failures, may discourage investments in railways and so may check competition. But from a practical point of view, the effect of overcapitalization on rates through its influence on competition is so indirect and problematical as to be hardly worth considering.

[4] Not always, however; the controlling interests in a financially sound company sometimes adopt the short-sighted policy in order to sell out at top prices.

Influence of Capitalization on Rates Under Government Control. In these days of strict government regulation, it is far more important to study the factors that influence our courts and commissions in their rate decisions than to discuss the rate-making policy of the railway management. For the government, not the railway, has the last word. General rate levels are now limited, not to what the traffic will bear, but rather to what the Interstate Commerce Commission or the United States Supreme Court will bear.

If regulating commissions were to allow railway companies to charge such rates as would earn interest and dividends on all outstanding securities, the relation between capitalization and rates would be obvious. But as a matter of fact, no such simple relation prevails; the connection is more indirect. In order to understand this connection, we must have in mind the general principles which guide a commission or a court in a rate case.

The starting point in the theory of rate regulation is the principle of common law, now supported by state and federal statutes, that public service enterprises must charge "reasonable" rates. Until very recently, no test of reasonableness has been set by statute. But in the United States a standard has been developed by the courts, under their authority to review all rate regulations to determine whether they violate the constitutional guaranties against confiscation of property. According to these court decisions, a company must ordinarily be allowed to charge sufficient rates to earn a "reasonable return" on the "fair value of the property being used by it for the convenience of the public." . . .

Capitalization and "Fair Value." As every student of public utility problems knows, the courts have never set any definite standard of "fair value" for rate making. Usually they have accepted a valuation based on a compromise of different possible tests. What these tests may be is indicated in the leading case of Smyth *v.* Ames.[5] . . .

On the basis of this dictum there are two distinct grounds on which the amount of capitalization might be given weight in estimating "fair value": first, it might be taken as evidence of "the original cost of construction" and of the "amount expended in permanent improvements"; second, it might be held to constitute in itself a vested right, to be honored at its face value. This second interpretation might follow from the fact

[5] 169 U.S. 466, 545 (1898).

that the dictum refers to the "amount and market value of its bonds and stocks" as separate items to be considered, distinct from the item of original cost. . . .

In the determination of "fair value" for rate-making purposes, courts have held that one of the most important elements to be considered is the original cost of the property. Indeed, the recent tendency, on the part of some commissions at least, has been to make it the controlling test—a tendency to which some authorities think that the courts will soon accede. Unfortunately, however, the railways of this country failed to keep accurate records of their capital costs until required to do so under the amendment of 1906 to the Interstate Commerce Act. So far from making correct entries of capital expenditures, many of the railways, prior to that date and to some extent even thereafter, deliberately made excessive charges to the capital account in order to conceal from the public and from the regulating commissions the true relation between profits and investment. The practice of stock-watering went hand in hand with a practice of inflating the property accounts which were written up so as to balance whatever amounts of securities the controlling interests might deem fit to issue.

In spite of its notorious inaccuracy, this nominal capitalization, to which the book values were made to correspond, has been the only record of actual costs possessed by the commissions and courts. Indeed, not only has capitalization been the only record of actual cost, but also, in the case of most railways, it has been the only test of any sort on which "fair value" might be based; for physical valuations have not yet been completed. . . .

. . . Railway spokesmen have repeatedly argued that the amount of outstanding securities should be given weight in determining fair value, entirely irrespective of the actual cost. The basis of this plea is the "innocent investor" argument. . . . These investors, it is held, should not be "penalized" for the sins of bygone financiers. . . .

On this point the theory of the law is sufficiently clear. The United States Supreme Court has held that public utilities are entitled to a return on the "fair value" of the property, not on the securities issued against that property.[6] To be sure, the above-quoted dictum in Smyth *v.* Ames states that in the determination of the fair value of a company's property, "the amount and market value of its bonds and stocks" are among the elements to be considered. But later decisions have been unanimous in holding that this statement did not imply the right to earn profits on fictitious securities. Indeed, quite the contrary view was expressed in the Smyth case itself, as well as in subsequent decisions. . . .

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[6] This statement applies to securities that have not been issued under the specific authorization of a public service commission. Whether or not securities, when officially approved by a commission, will create a legal claim in rate decisions has not as yet been settled in court. The public utility laws contain a disclaimer of any obligation or guaranty on the part

Public service commissions, no less than courts, have been almost unanimous in asserting that capitalization is not of itself an element in "fair value." . . .

Few authorities today would question the statement that in the theory of the law, at least, a capitalization in excess of actual assets should have no consideration in fixing the "fair value" of the property. But it is often maintained by persons familiar with the procedure of rate cases that, despite all theory, courts and commissions do give weight to the claim for a return on excessive security issues. The "innocent investor" plea is thought to have some influence. . . .

But without denying this past influence of capitalization on "fair value," one may seriously question whether any such connection need prevail in the future. . . .

The present chaotic condition will not last. As soon as the government adopts a definite standard of valuation, and as soon as it secures the necessary records of cost, it will have removed the uncertainties that have caused rate regulators to take account of security issues in estimating "fair value."

The following conclusions may now be set forth as to the relation between capitalization and "fair value" for rate making. The amount of outstanding securities has been a factor in valuation proceedings, first, as evidence of the actual investment; and second, as an item entitled to some weight on its own account. The latter consideration, however, is not explicitly stated in the decisions of courts and commissions, and one is left to infer its influence from the unofficial remarks of commissioners. But, although capitalization has been, on both of the above grounds, an element in valuation, there is no good reason to suppose that it need continue to remain an important factor in the future. For after a physical valuation has been completed and after a definite basis of rate-making value has been set, courts and commissions will have no reason or excuse for

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of the state with respect to authorized securities; but some authorities are doubtful as to the complete efficacy of this disclaimer.

accepting the par value of securities as an indication of the "fair value."

If one were to assume that the evil of stock-watering lay simply and solely in a resulting overvaluation of railway property for rate-making purposes, one might fairly question whether the most expedient way to cure the evil would not be to prevent the overvaluation without troubling to prevent the stock watering.[7] Government regulation of security issues is a costly experiment. Would it not be wiser, then, to leave the private railway managements free to determine the amounts of securities and simply to require that any excessive issues must not be permitted to inflate the property accounts? In short, could not stock-watering be made innocuous by full publicity of the actual investment? . . .

Capitalization and the Rate of Return. When a commission has found the "fair value" of a railroad property, it must next determine the rate of return which the company is entitled to earn on that value. The courts have held that this return must be "reasonable"; but their decisions as to what constitutes reasonableness have been even more indefinite than have been their decisions on "fair value."[8] The tendency of the courts, however, has been to leave the commissions much more discretion in the former matter than in the latter.[9] Beyond insisting on a certain minimum,—say 5 or 6 per cent—the courts have not been disposed to hold that any rate fixed by a commission is confiscatory. Our study of the effect of capitalization on the rate of return must therefore emphasize the practice of commissions rather than the rulings of courts.

In fixing the rate of return, public service commissions must take account of two different considerations: The one is the question of fairness to the investors; the other is that of public expediency. Is the given return a fair compensation for the use of the present investment? If so, is it sufficient to attract new capital into the business? Both of these questions must be answered before deciding what rates a public utility should be allowed to charge.[10] . . .

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[7] Some years ago, a bill to secure this object was introduced into Congress by Representative Adamson. Mr. Adamson was at that time opposed to the plan for federal regulation of railway securities. As a substitute for such a measure, he introduced a bill providing that if any railroad should plead inadequacy of return on its securities as a reason for being permitted to raise its rates, it must present evidence that those securities represent actual investment. *Congressional Debates, 61st Congress, 2nd Session,* (1910) Vol. CV, pp. 5592-4. A somewhat similar proposal was made by Mr. S. Z. Mitchell, President of the Electric Bond and Share Company, at a hearing of the Senate Committee on Interstate Commerce, December 14, 1915.

[8] On the rate of return, see Robert H. Whitten, *Valuation of Public Service Corporations,* 2 vols. (New York, 1912-14), Vol. I, Chap. XXX, Vol. II, Chap. XXX; Beale and Wyman, *Railroad Rate Regulation,* 2d ed., by Bruce Wyman (New York, 1915), Chap. VII.

[9] Whitten, Vol. I, p. 690.

The Fair Rate.—While decisions as to what constitutes a fair rate do not all agree, the generally accepted principle is this: that the rate should be such as would induce the investment of capital in similar enterprises, similarly situated. . . .

How, then, may this rate of return be affected by nominal capitalization? Only in a very indirect way; namely, through the possible effect of capitalization on the credit of the railways. The fact that many railways have been overcapitalized, and otherwise financially mismanaged, may bring railway investments into disrepute, and may therefore raise the rate of return that is necessary to attract capital into that class of enterprise. An artificial element of risk is created—the risk that railway companies may be found to be financially top-heavy; and investors may fairly demand that the public should pay them a higher rate of return for assuming that risk.

That this relation between capitalization and the rate of return may not be merely theoretical will be recognized by impartial students of American railway finance. Fiascos like Rock Island, Alton, and Frisco, caused largely by reckless overcapitalization, have helped to bring all railway investments into disrepute, and have therefore tended to raise the rate of interest that must be offered to attract capital. . . .

But of much more significance than the relation of capitalization to the fair rate is its relation to the expedient rate—the rate that may exceed what is considered "fair." . . .

The Expedient Rate.—In the previous paragraphs we noted that commissions have generally held that a "fair rate" of return on public service property is that rate which will attract capital into enterprises of a similar nature. Ordinarily, this would also be the "expedient" rate; that is, it would be the minimum rate needed in order to maintain the good credit of the company and its power to give adequate service. But sometimes the "fair rate" would not be sufficient for this purpose. Let us suppose that the company in question is seriously overcapitalized; that its earnings under present rates are barely sufficient to enable it to pay its interest charges and thus to escape bankruptcy. A company in this condition will be able to borrow money, if at all, only by paying exorbitant rates of interest. It would be quite unable to secure this money if it were allowed to earn merely the "fair rate", *i.e.* the rate current on other railways similarly located but more conservatively capitalized. . . .

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[10] That is to say, the commissions must pay regard to both of these questions; on the other hand, the courts usually take account merely of the first point.

Commissions have frequently been obliged to face such situations in fixing rates that apply to weak railways and public utilities. They are confronted with this dilemma: that they must either sanction exorbitant rates or else accept the consequence of poor service. Which horn of the dilemma have they chosen? That is a difficult question to answer. The difficulty lies in the fact that commissions, in their rate decisions, have seldom made a clear-cut distinction between what is fair and what is expedient. They have never decided, for example, that a particular company should be allowed only 5 per cent as a "fair" rate of return, but that 7 per cent should be allowed in order to maintain the corporate credit. On the contrary, they have fixed a so-called "reasonable" rate, without stating the extent to which necessity rather than fairness has been the test of the reasonableness. This is perfectly natural in view of the uncertain and indefinite standards that have prevailed as to what is fair. It is doubtful whether the commissions know themselves just to what extent justice and to what extent public policy is their guide in fixing the rate.

But for all this uncertainty, a study of recent rate cases leaves no doubt that excessive returns have sometimes been permitted in order to bolster up the credit of overcapitalized or mismanaged companies. . . .

Conclusions. Overcapitalization may affect rates:

I. When rates are fixed by the railway management,
  (1) Under monopoly conditions, by causing the management to adopt the short-sighted policy of charging high rates in order to secure maximum returns in the immediate future, instead of charging lower rates in the expectation of building up traffic in the long run.
  (2) Under competitive conditions, by causing the management to adopt the equally short-sighted policy of cutting rates unduly so as to secure a temporary advantage over competitors.

II. When rates are fixed by government authority,
  (1) By raising the valuation on which the rates are based,
    a. through the use of capitalization as evidence of the original investment,
    b. through the tendency of courts and commissions to accept the amount of securities as constituting, *per se,* an element in the "fair value,"
  (2) By raising the rate of return which companies must be permitted to earn, because of the tendency of overcapitalization to weaken the corporate credit, and thus by affecting
    a. the "fair rate," *i.e.* the rate necessary to attract capital into similar enterprises,
    b. the "expedient rate," *i.e.* the rate necessary to attract capital into the particular enterprise in question.

Since rates are now subject to strict regulation by the government, the relations listed in the second division of the above outline are the only ones of present importance. Under government control of rates, capitalization may affect transportation charges in two ways: first, by influencing the "fair value" of the property as fixed by a court or a commission; second, by influencing the rate of return that a company may be permitted to earn. But the relation of capitalization to "fair value," while it has doubtless been present in the past, need not continue in the future provided that the railways are required to keep accurate records of actual investment. As an argument for security regulation, therefore, the presence of such a connection in the past cannot be considered of much weight. With respect to the rate of return, however, the influence of capitalization cannot be so easily overcome. The fact cannot be denied that a financially weak railway—whether that weakness is due to overcapitalization or to any other cause—cannot secure the funds for developing its business without paying an exorbitant rate of interest. The public, then, must either pay that interest in higher rates or must suffer the poor service that will result from a failure to secure the capital.

It is true that there may sometimes be a third alternative. Instead of permitting a financially weak railway to charge excessive rates, a commission might keep down the rates to a minimum and thus force the railway into a receivership and a reorganization. That heroic method may be the very best solution, but it cannot be considered an adequate one, for two reasons: first, because bankruptcy brings discredit, not merely on the particular company, but also on all railway enterprises; second, because a weak company may not be quite weak enough to be forced into receivership. For years the company may lead a hand-to-mouth existence on the low rates, and a commission may be powerless either to make it give good service or to compel a reorganization.

Effect of Capitalization on Service

Overcapitalization, we have just seen, must lead to one of two things, if not to both: excessive rates, or inferior service. Most of the popular discussions have emphasized the first result. Yet, of the two, the latter is much the more serious. A financially weak railway is far more likely to reduce its standards of service and to neglect necessary improvements than it is to raise its rates. The former policy is the easy one; the latter presents many difficulties. . . .

There are two chief reasons why poor service rather than high rates has been the more frequent outcome of overcapitalization. In the first place, competition has prevented a financially weak road from charging higher rates than its competitors. . . .

In the second place, commissions have been reluctant to allow weak companies to bolster their credit by charging excessive rates. . . .

Of course, it would not be correct to assume that in all these cases the financial weakness that was responsible for the inadequate service was caused wholly by overcapitalization or by other forms of financial abuse. The causes of railroad failure have been diverse; excessive competition has been an important factor,[11] and in not a few cases, unjust rate regulation must share the blame. But it is none the less true that in all of the instances mentioned above and in most of the recent cases of receivership, overcapitalization has been an important factor in the trouble.[12] . . .

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[11] Referring to failures since 1907, Stuart Daggett says: "Generally speaking, the failures were in the intensely competitive territory of the Central Freight Association, and in the less densely settled sections west and southwest of the Mississippi River." *Quarterly Journal of Economics*, XXXII (1918), 448.

[12] For a discussion of the causes of recent railroad failures, see Daggett, *op. cit.;* also, Fankhauser, "Receivership and Reorganization of Steam Railroads," printed as an appendix to the "Newlands Committee" *Hearings* (Vol. II, pp. 1937-2138). For failures prior to 1907, see Stuart Daggett, *Railroad Reorganizations* (Cambridge: Harvard University Press, 1908).

Conclusions

The discussion in this chapter, it is hoped, will serve to show how unwarranted is the assertion . . . that the capitalization of railway companies is not a public concern. And yet, it is equally clear that the influence of the amount of outstanding securities is by no means as direct as is frequently assumed by railway critics. The medium of this influence is credit. Credit forms the connecting link between capitalization on the one hand, and rates and service on the other. It is the failure to appreciate the indirect nature of this connection that has been responsible for the conflicting views on the subject. That improper capitalization is injurious to corporate credit would be denied by no one; on the other hand, that poor credit is prejudicial to the interests of the public is recognized by all. The conclusion that capitalization must therefore be a matter of public concern would seem to follow as a matter of course. Yet for years it has been vigorously denied by railway spokesmen. In almost the same breath they have asserted the need for higher rates in order to support railway credit, while denying the need for sound capitalization to further the same object.

But while the foregoing conclusions justify the public suspicion of stock-watering, they also indicate that a shift of emphasis is required in explaining the evil and in providing a cure. . . . In the future, . . . the only serious danger from overcapitalization will be, not that it will be an element in determining fair value, but rather that it will injure credit. But that raises a new question. What is the exact relation between capitalization and corporate credit? Is it simply that low capitalization tends to create sound credit, and high capitalization to create weak credit?

According to a prevalent view, there is an inverse relation between a company's capitalization and its financial soundness—low capitalization tends to cause good credit, high capitalization to cause poor credit. As a very rough generalization, this statement may be allowed to pass; but it is subject to qualifications of such importance that it cannot be accepted as a satisfactory guide to financial practice.

Overcapitalization tends to weaken corporate credit, not directly because of the heavy nominal liabilities, but simply because those liabilities are apt to create excessive interest and dividend charges. But the relation between the capitalization and the amount of capital charges is not close. A company with an absurdly high capitalization may have a lighter burden of interest and dividends than a company capitalized at a low figure. In the former case, the rate of interest and dividends may be lower than in the latter case, so as more than to offset the difference in the amount of securities. Moreover, the highly capitalized company may have issued large amounts of stock but only a small amount of bonds and may therefore be able to make its payments contingent upon the earnings, while the undercapitalized company may have incurred a heavy debt and may be unable on that account to reduce its fixed charges in times of financial stress.

For these reasons it is necessary to take even more account of the *kind* of capitalization than of its total *amount*.

The position emphasized in the foregoing discussion—that the source of danger in stock-watering lies in the rigidity of *established* values even more than in the deceptive nature of *par* values—leads to two conclusions of much practical consequence. In the first place, it indicates that the evil to be guarded against is not so much overcapitalization, in the usual meaning of that term, as an *undiscounted increase* in capitalization. Indeed, the danger of inflation is almost as great in the case of a company that has been *undercapitalized* and that now raises its capitalization to normal as it is in the case of a company which was originally capitalized at its actual cost and which now issues a stock dividend. In the one case, as in the other, investors are liable to be deceived by a false assumption that the increased amount of securities means increased earnings and larger dividends.

The second practical implication of the theory that we have been discussing is that the more serious evils of stock-watering cannot be cured by the mere recourse to the recently favored plan of issuing shares without par value. Removal of the par value, to be sure, removes one of the sources of deception; but it leaves untouched the other, more potent, source. For, even without par values, an increase in the *number* of shares, unless accompanied by a corresponding increase in earning power, may result in a dangerous inflation of market values.[13] . . .

Although stock-watering is a favorite device by which speculative financiers attempt to inflate market values, it is not the only device. Indeed, unless used in connection with other methods of creating false hopes, it is not apt to be effective. Promoters never rely solely on the tendency of investors to think that more stock means more earnings; they attempt to further that tendency by various kinds of manipulation. Glowing prospectuses and optimistic financial statements are issued; investors are assured that the higher capitalization is justified by the increased earning power that may be expected as a result of the new management, or as a result of the advantages of consolidation with other companies. The deception may be even more downright; it may take the form of falsified earnings statements, "padded" balance sheets, and false rumors of increased dividends. . . .

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[13] But this statement is not meant to condemn shares without par value; it is meant simply to indicate their limitations. The matter is discussed at length in Chap. IV, *infra*.

Overcapitalization tends to weaken the credit of a railway corporation by creating excessive interest and dividend charges. But the amount of these charges is not in direct proportion to the nominal capitalization. Much depends on the nature of the securities. *Bonds* carry a fixed rate of interest; they therefore impose a burden of charges that cannot be lightened in times of adversity. *Preferred stocks* also carry a fixed rate, but the dividends may be reduced or completely passed if they are not earned. Nevertheless, the necessity of passing the preferred dividends reacts unfavorably on the credit of the company; it should therefore be avoided, if possible, by keeping the amount of preferred stock within safe limits. *Common stock* has no fixed rate of dividends; and this fact has led some financiers to assert that the amount of the issue is a matter of indifference. But we cannot accept this view. It fails to take account of the fact that even on common stock the dividends are not perfectly flexible. Although in theory they are supposed to be determined by actual earnings, in practice they are apt to be held at the *expected* rate. This rate becomes a quasi-fixed charge, and failure to pay it reacts on the corporate credit in the same way as would the passing of a preferred dividend. Even more harmful than the *failure* to pay an expected dividend is its *actual payment* out of capital when it has not been earned. Yet an overcapitalized company is under pressure to do this very thing rather than to admit that it cannot pay its dividends.

But why is it that an excessive issue of stock may cause investors to expect excessive dividends? Why may they not be content with a lower rate of dividend on the higher amount of stock? To these questions there are two possible answers. First, investors may assume that par values represent the actual investment; they will therefore expect the *ordinary* rate of dividends on an *extraordinary* amount of stock. Second, they may assume that a company which issues watered stock will continue to pay the *established* rate of dividends on the *increased* number of shares. Of these two points, the second is the more significant. The danger of stock-watering lies therefore not so much in the excess of par value over actual assets as in the increase in the number of shares without a corresponding increase in earning power.

133. Shares of Stock Without Par Value *

Advantages. The par value of a share of stock can have no significance except in so far as it represents actual assets. In the theory of the law, that is just what it is supposed to represent; in practice, it represents nothing of the kind. This divergence between theory and practice is due in part to the lax corporation laws of several states; but it is also due to another cause which cannot be removed; namely, to the impossibility of issuing stock always at par regardless of the conditions of the market.

Since, therefore, par value cannot serve its intended purpose of indicating the actual capital, it may better be removed instead of being allowed to remain as a source of deceit to unwary investors. The removal may be expected to have the wholesome effect of forcing the attention of investors upon the value of the property behind their securities rather than on the nominal amount of those securities. This result, if it can be achieved, will mark a great advance in corporation finance; for too often have investors been deceived by their assumption that a large nominal capitalization means an equally large investment. To eliminate this danger of deception would be to remove one of the serious evils of stock-watering.

To be sure, it must be admitted that the mere use of shares without par value will not *alone* cure the evils of stock-watering; for the removal of par value does not remove *all* the sources of deception to which the unwary investor is subject. But the truth of this admission does not weaken the force of the fact that *one* source of deception may be removed; and that consideration alone justifies the reform.

The opinion has sometimes been advanced that the use of shares without par value, while suitable for business corporations, should not be extended to railroads or to other public service corporations whose securities are subject to control by a government commission. Regulation of securities is thought to be an alternative to the removal of par value; the one measure aims to prevent stock-watering by making the par value equal the investment, while the other would secure the same end by abolishing the par value entirely.[1]

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* Excerpts from J. C. Bonbright, *Railroad Capitalization*, Columbia University Studies in History, Economics and Public Law, Vol. XCV, No. 1 (New York: Longmans, Green and Company, 1920), 106-131.

If commission regulation could in fact secure an approximate balance between nominal capitalization and actual investment, one might concede the wisdom of retaining the par value of public utility stocks. But . . . no such results have been secured, nor is there any likelihood of success in the future. In a large number of cases, par values will either understate or exaggerate the actual contribution made by the investors. Therefore as long as par values are retained, they will remain a source of misinformation.

Of course, one may freely admit that careful control of securities by a commission will greatly reduce the danger of deceit occasioned by fictitious par values. Not only will the more extreme forms of stock inflation be prevented, but, what is even more important, the investing public will be informed as to the actual capital in the enterprise, so that it may discount any excessive stock issues. Yet, with all these cautions, the danger of misunderstanding is merely minimized but not removed so long as the par value remains. The "magic of par value" is too potent to be entirely eliminated by a program of publicity.

But there is even a stronger reason for removing the par value of public utility stocks. Unless it is removed, commissions will still feel under obligation to *strive* for an approximate equality between capitalization and investment. Of course they will not succeed,—they never have succeeded,—but instead of abandoning all effort to secure an equality, they will make the attempt to come as near to a balance as is at all practicable. They will permit the issue of stock below par—but only as a last resort, rather than as a regular and proper procedure. This, at least, has been the tendency of state commissions up to the present time; and it is almost sure to continue to be the policy in the future, owing to the popular hostility to stock-watering.

This half-way measure—this *partial* abandonment of the attempt to make capitalization correspond to assets—is in many ways more dangerous than would be the complete recognition of par values as a mere fiction. In the first place, it serves to strengthen rather than to weaken the illusion on the part of investors that par value represents the actual investment. In the second place, it causes commissions to approve the resort to excessive bond issues as a means of avoiding the necessity of selling stock below par. This second tendency was noted in the last chapter as a serious objection to security regulation as now practiced by state commissions; but it is almost inevitable as long as commissions are under pressure to prevent the sale of stock at a discount. The only adequate means of removing this pressure is to remove the par value, so that stock may be issued at whatever prices are justified by market conditions.

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[1] Cf. M. B. Ignatius, *Financing of Public Service Corporations* (New York: the Ronald Press, 1918), p. 83.

One special advantage of shares without par value deserves particular emphasis at the present time; namely, their convenience in cases of reorganization and consolidation. Few will deny that any program of railway reform has little chance of solving the present difficulties of our interstate transportation systems that does not involve, first, a reorganization of unwieldy financial structures and, second, a consolidation of certain independent roads into larger groups. Heretofore, however, both of these financial operations have usually resulted in an increase rather than a decrease of nominal liabilities. It is true that, in recent years, when reorganizations and consolidations have been subject to the approval of state public service commissions, the tendency to inflation has been partly eliminated. But even in these cases, commissions have usually found it impossible to enforce a rigid scaling-down of capitalization to the point of equality with the assets. The obstacle has been the reluctance of security holders to accept new securities of a lower *par value* than that of the stocks and bonds which they are asked to surrender. To be sure, the commissions might have insisted on such an exchange; but in the case of consolidations, that requirement might have caused the stockholders to abandon their plan for a merger, while in the case of reorganizations, it would have led the security holders to decline either to pay assessments or to subscribe for new securities.

The use of shares without par value, however, will make it much easier to consolidate or to reorganize on a sound financial basis. Because of the removal of par values, there will not be the same need for a stringent reduction in the number of shares; the holders of one share of old stock may be given with less reluctance one share of new stock, since the new stock indicates nothing as to the amount of investment represented by each share. . . .

Alleged Objections. Having noted the advantages to be gained by authorizing railroads to issue shares without par value, we must now discuss the supposed objections. At least six criticisms have been made.

1. That the removal of par value will encourage inflation by making easy the issue of an excessive number of shares.[2] . . .

2. That the removal of par value will encourage the flotation of shares of low market value—a result conducive to over-speculation.[3] . . .

3. That the removal of par value will release stockholders from their liability to creditors for the full payment of their subscriptions. . . .

4. That the removal of par value will make it easier for promoters to retain an excessive amount of the stock as a reward for their services. . . .

5. That par values are necessary, or at least desirable, as a convenient device for accounting. . . .

6. That the removal of par value will open the way to the impairment of capital.[4] . . .

Stock-Watering. Although most of the objections urged against the use of shares without par value are unwarranted, many of the claims in its favor are equally unfounded. Frequently it has been advocated as in itself offering a cure for the evil of overcapitalization. Business men have favored it, not as a mere aid to the government in its control over public utility securities, but as an all-sufficient substitute for such control. . . .

After all, the abandonment of par value merely gets rid of one of the deceptive figures in corporation accounting. It does not substitute the correct data. A share, it indicates, is simply a fraction of a given total investment. But how large is this total investment? That remains to be shown. Nothing less than government supervision can insure a correct statement of the actual investment.

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[2] Glowing prospectuses, optimistic financial statements, and assurance that the high capitalization is justified by increased earnings inflate market values while in case additional shares are issued they may be put out at lower than market prices at the expense of the existing stockholders.

[3] Low-priced shares are inherently conducive to speculation since a slight change in earnings or prospects causes a proportionately large fluctuation in price.

[4] Unless the law specifies the amount to be preserved as Capital in relation to the investment on the part of the stockholders then a portion of this sum may be declared out in dividends impairing the stockholders equity at a time when it appears that the company is prosperous. (See 2.)

It cannot be too strongly emphasized that the use of shares without par value will not of itself remove the danger of stock inflation. This point has been already discussed in an earlier chapter.[5] How is it possible, one asks, to inflate shares without par value, when each share is now supposed to represent, not a definite amount of investment, but merely a certain *fractional interest* in the total property? The answer is that shares, even shares of no par value, will not be regarded by investors as representing mere fractional claims. People do not think in those terms. They think of a share as representing *an amount* not *a fraction.* That amount is determined in their minds largely by the market quotations and by the established dividend. If, then, the number of shares is doubled without any increase in earning power,—say, by the issue of a stock dividend of 100 per cent,—investors will probably fail to see that each share now represents an earning power of only half its former amount. The market values of the new shares will therefore be inflated. By taking advantage of this failure of investors to discount the increase, unscrupulous financiers will be able to profit in the future, as they have profited in the past, by issuing shares in excessive amount.

We conclude then, that only when accompanied by more positive forms of regulation does the device of shares without par value promise much relief from the evils of overcapitalization. Its role is the modest though significant one of removing a fictitious statement in order to leave a clean sheet for the correct information. The more ambitious part claimed for it of solving in itself the problem of stock-watering, it is wholly unfitted to play.

Proper Scope of Application. If we accept the general principle of the proposal to issue shares without nominal value, two questions arise as to the proper extent of its application in railroad law. First, should it apply to preferred stocks as well as to common? Second, should it be compulsory or simply optional? . . .

At least two reasons may be given for retaining the par value on preferred shares, even when it is removed from the common. *First,* this distinction between the two classes of stocks conforms to a custom, not infrequently observed in corporation finance, of issuing bonds and preferred stock in amounts equal to the value of the tangible assets, and of issuing the common stock as a capitalization of intangible assets, such as "good-will" or "franchise value." By requiring this additional stock to be issued without nominal value, the law attempts to compromise between the exigencies that may be thought to require stock watering and the traditional principles that demand an equality between par value and assets. *Second,* the distinction is defended on the assumption that, when stocks are preferred not only as to dividend but also as to assets in the event of dissolution, the par value is necessary in order to define the amount of this prior claim.

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[5] P. 57, *infra.*

The first point rests on a principle of capitalization that is neither practicable nor desirable. It is not practicable because the difficulties, already noted, of securing an equality between par values and assets would remain the same even though common stock were not to be counted as a part cf the total capitalization. It is not desirable because the issue of bonds and preferred stock up to the amount of the actual investment would often exceed the limits of safety for these classes of securities.

The second argument has some force but is by no means a determining consideration. Even without the device of par values, stipulation can be made as to the claim of preferred shares in the event of dissolution. To be sure, the presence of a par value gives more publicity to the amount of the claim; but that point is of no great importance.

Although the positive objections to the removal of the par value from preferred stocks are not convincing, one must concede that the reasons in its favor have less force than with common stocks. For with the former class of security, the fixed rate of dividends prevents the nominal value from influencing appreciably the market valuation. If the dividend charges are kept within safe limits, investors are not liable to be misled seriously by fictitious par values. The great danger of deception is in connection with the common stock. On the whole, however, it is probably wiser to go the whole length by removing the par value from all classes of stock.

Should It Be Made Compulsory? As proposed by the Railroad Securities Commission, and as provided in all the present state laws, the issuance of no-par shares is made entirely optional with the companies. Should this continue to be the case with respect to the federal railroads, or should the change be made compulsory for all of them?

The defense of a purely optional law is that the right to issue shares of no-par value is offered as a means of avoiding the necessity of issuing stock below par. Corporations may be given their choice of two practices: They may either issue no-par stock at such prices as the market justifies, or else they may retain the par value, but subject to the strict requirement that all such stock must be issued at not less than par. If they choose the latter plan, they may then be held to rigid accountability for observing the statutory requirements as to the issuance price of the stock.

But while an optional provision may be conceded to be better than no provision at all, there can be little doubt that a compulsory measure will be much more satisfactory. The advantage to be gained by the more thoroughgoing measure is the advantage of uniformity. If some railroad companies are permitted to issue no-par stock, while other companies retain the old form of shares, confusion will result. The success of the new system depends on the degree to which investors are educated to an appreciation of the fact that their shares represent, not a fixed amount of investment, but simply a right to a certain portion of the corporate income. This educational process will go on much faster if the removal of the par value is made general for all railroad corporations. Needless to say, it would go on still faster if it could be made universal for all corporations of every character. The latter goal, however, is not apt to be reached under the divergent laws of many states—not at least for many years. But the general adoption of the plan by all interstate railways may be secured under a law requiring federal incorporation.

Summary. The proposal to remove the par values from issues of stock is a recognition of the hopelessness of the attempt to maintain an equality between nominal capitalization and actual investment. Several objections have been urged against the plan, but they are based, for the most part, on a mistaken or exaggerated notion of the usefulness of par values.

On the other hand, the proponents of this plan have often claimed for it too much. They have asserted that its adoption would make all further measures of protection against stock manipulation unnecessary. This view cannot be sustained. The abolition of par value simply removes one source of misinformation. It does not remove all sources; still less does it provide the necessary valuation that must take the place of the nominal capitalization. These objects can be secured only by positive measures of financial control.

Nevertheless, the removal of par value is good as far as it goes. As applied to the railroads, the measure should be thoroughgoing; it should be compulsory rather than optional, and it should apply to stocks of all classes, common and preferred.

134. The Principle of Trading on the Equity *

Business enterprises ordinarily obtain the services of capital[1] and of individuals in return for interest[2] and wages. Owners of capital and other individuals are willing to relinquish control over their property or services in return for these more or less fixed compensations; first, because of their confidence in the ability and willingness of the enterprise or its owners to pay the predetermined compensations and to return the property or its equivalent (in the case of capital) at the time agreed upon; second, because the capital provided by the owners of the business serves as protective margins to be used in their entirety to satisfy claims of creditors in case of liquidation, before the owners receive anything; and third, because the revenue of the business is applied in the payment of interest and wages before the owners share in the proceeds.

These margins of protection are the equity on which the owners of an enterprise bargain or trade with owners of capital and other individuals, to obtain the use of their property and services for as low a compensation as possible—hence the concept and expression, *trading on the equity*. The compensation to owners for their capital and services contributed to the business as owners, not as creditors or true employees, is a residue remaining from the proceeds of the sale of products or services after payment of or provision for all expenses including interest and wages. Consequently, the better the bargain the greater is the residue.

Trading in the First Degree

Equities in Assets. Trading on the equity is a fundamental and universal principle of finance. Investors are willing to lend their capital and to take a lower return than is expected to be earned on the capital, because of a preferred claim on asset value expected to be in excess of the loan at its maturity and on prospective earnings in excess of the interest charges thereon. These protecting equities in assets and income are provided by the investments of junior security holders, both bond- and stockholders who are willing to put their entire investment up as security for underlying liens in return for prospective higher rates of return.

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* Adapted from Paul L. Morrison, *Public Utility Holding Companies, A Study in Trading on the Equity*, Chap. 1. A Thesis presented in partial fulfillment of requirements for degree of doctor of philosophy at Northwestern University, 1927.

[1] In this discussion capital is used to include land.

[2] Including rentals, royalties, and other payments for the use of capital.

Equities in assets become important at the maturity of an obligation or at the liquidation of a concern, for at those times they are positive protection. At other times they are merely potential. At maturity it is important to know whether or not sufficient assets are available in liquid or liquidable form to pay off the obligation or whether the credit of the company is such that a refunding issue can be sold for the purpose of continuing the business. At liquidation, particularly if forced, book values may shrink substantially, so the greater the possibility of failure and of loss in assets the greater should be the margin of assets and income behind the loan and the higher the rate of compensation.

Assuming a firm with a bond-preferred-common stock ratio of 50-25-25 the assets (providing assets were originally equal in value to the outstanding capital obligations) must shrink 25 per cent before preferred stockholders suffer loss, and 50 per cent before bondholders suffer loss, while common stockholders lose 100 per cent of their investment on a 25 per cent shrinkage in assets but on the other hand they alone[3] share the chance of a 100 per cent gain should the assets increase 25 per cent in value. In return for additional protection bondholders are willing to accept a lower income and junior security holders are entitled to larger compensation in return for their increased risk.

Since public utilities render essential services under condition of regulated monopoly[4] the number and severity of failures and of losses tend to be less than in industrial concerns, so bondholders can trade on "thinner" equities (*i.e.* less junior investment) than can industrials.[5] Trading on the equity in assets is, thus, encouraged by fundamental conditions in the industry.

Equity of junior security holders appears as protection to senior issues in regard to income as well as to principal. Taking a simple illustration: A utility with a rate base of $1,000,000 represented by $500,000 5 per cent bonds; $250,000 6 per cent preferred stock, and $250,000 common stock is allowed and earns an 8 per cent rate of return. This allows a total return of $80,000 which represents the equity of the bondholders in income or 3.2 times their interest requirements. Deducting bond interest there remains $55,000 to share among the stockholders and this represents protection of 3.67 times the dividend rate fixed for the preferred stockholders. The residue [$80,000 — ($25,000 bond interest + $15,000 preferred dividends) or $40,000] represents the return to the common stockholders.

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[3] The prior lien securities would, of course, share in the greater security.

[4] Which does not necessarily eliminate competition between kinds of service—motor bus and traction, electricity and gas, etc.

[5] Unfortunate conditions in recent years in electric railways require that generalizations and class comparisons be made with care.

Thus, even though the rate of return on the investment has been restricted by the regulating commission to 8 per cent, common stockholders here earn 16 per cent on their investment through trading on the equity. The comparative stability of the industry under regulated monopoly provides the basis for borrowing at low rates relatively large proportions of capital employed by public utilities. The amount that accrues to the common stockholders is dependent neither on the actual property value contributed by them nor on the value at which the common stock is carried on the balance sheet. It is a residue. Of course, the tendency is for a greater investment to produce larger returns but if the larger returns do not materialize the common stockholders have no recourse.

If, under the assumed conditions, the gross income had declined so that only 4 per cent was earned on the rate base then the return to the common stock would have been negative (providing the preferred stock was cumulative) due to the fact that earnings were not sufficient to cover the contractual interest requirements [$40,000 — (25,000 bond interest + 15,000 preferred dividends) = — 5,000].

Under similar conditions to those existing in our hypothetical company with a change in the capital ratio to 70-25-5 represented by $700,000 6 per cent bonds; $250,000 7 per cent preferred stock, and $50,000 common stock, the gains of trading on the equity are magnified several fold. The earnings are now distributed $42,000 to bondholders whose protection is now only 1.9 times interest requirements; $17,500 to preferred stockholders whose requirements are earned only 2.5 times while the common stockholders receive the balance of $22,500 which represent 45 per cent on their investment. For this reason there is a powerful incentive for thinning of equities in assets, even at increased rates on borrowed capital. In many cases, however, the fact that a very small fluctuation in gross incomes or operating expenses may affect earnings adversely so as to wipe out the margin of safety causes the lenders to demand such high interest that such trading is unprofitable.

With a change in gross income from 8 per cent to 4 per cent on the rate base earnings are no longer sufficient to pay the interest on the bonds and the result is a deficit of $19,500 with no returns on the common whatsoever. This represents a net loss of 39 per cent to the common stockholders.

By *a priori* reasoning, therefore, it appears that the thinner the equity of stockholders (and therefore of bondholders) in the assets of a company the greater will be the relative fluctuations in the equity in the income when expressed in relation to the investment of the stockholders and to the investment of bondholders. The thinner the equity, the greater the probability that a loss may result not only to common stockholders but also to preferred stockholders and bondholders because of the relatively greater proportion of the total capital provided by the latter classes. Likewise, the thinner the equity, the greater the probability for large returns on the common stockholders' investment.

Holding Company Operations—Trading on the Equity

The Thinning of the Equity in Assets. The principle of trading on the equity for many years has been applied to most industrial, commercial, and public utility activities. Adopted by the early entrepreneurs as a means of getting started in business it has grown until it is now employed as a means of long time control over huge volumes of capital enabling promoters and entrepreneurs to show large profits whenever thin operations prove successful. In the public utility field this later development of the applied principle of trading on the equity is known as the holding company.

A, B, and C, the owners of the common stock—the equity—of company M, form company X, pledge their stock in company M as collateral, and with a loan secured in this fashion purchase the common stock of company N. Thus, assuming companies with equal assets and capitalization at the ratio of 50 : 25 : 25, our hypothetical Messrs. A, B, and C now have control of double the amount of capital with no additional investment and instead of the equity in the new company being 25 per cent of the assets as it was in the old companies it is now 12½ per cent. Company X may now continue to expand purchasing the stock of other companies and issuing its own securities on the basis of say a 50 per cent debt to 50 per cent owned capital ratio in order to secure the funds necessary for these purchases. This practice preserves in our hypothetical case the same equity as existed at the time companies M and N were acquired and the ratio stands 87½ per cent secured indebtedness to 12½ per cent equity capital.

In case the equity in companies M, and N, etc., happens to be less than the assumed ratio of 50:25:25 the equity in the holding company will be proportionately smaller. This same principle may be illustrated by subjecting holding company X to another "unifying" operation.

Certain promoters, observing possibilities of still further economies or the possibility of profits in the integration of companies of the type X, form holding company Z for the purpose of acquiring the stock of company X and a similar company Y. They secure an option on or control of the stock of said companies and to finance this operation they issue their securities at the rate of 50 per cent preferred stock and bonds to 50 per cent common stock. Thus the holders of the 50 per cent equity—the common stock—of company Z control all of the assets of companies X and Y with an investment[6] equal to only 6¼ per cent. This process is commonly known as pyramiding and if carried forward through several such "unifying" processes results in the control of a large volume of assets with a comparatively smaller financial responsibility.[7] Therefore, a small shrinkage in the value of the assets of the underlying companies may in the case of liquidation wipe out the equity held by the holding company and result in losses not only to the stockholders but to the bondholders as well.

The Thinning of Equity in Earnings. When applied to earnings the effects of pyramiding are identical with those previously outlined. . . . A slight fluctuation in the gross income of the underlying companies may wipe out all or a greater part of the holding companies equity in income and cause even senior securities to suffer a loss. Companies X and Y, neglecting holding company income for services rendered the operating properties,[8] secure revenues only after the bonds and preferred stock of companies M, and N, etc., are satisfied and dividends declared on the common stock. Thus not only the stockholders of company X but the bondholders as well are dependent upon M and N, etc., earning on their equity. Likewise the security and stockholders of company Z are dependent on the equity earnings of companies X and Y before anything accrues to satisfy their claims for interest and dividends.

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[6] This assumes, of course, that the equity has not been further thinned through the process commonly known as stock-watering.

[7] Instead of purchasing all of the stock only enough to control the company may be secured, thus enabling the company to control still larger properties with the same amount of capital.

[8] As long as the holding company owns all of the common stock it makes little difference—except from the regulatory standpoint—whether this is taken out of the subsidiary as an operating expense or dividends. When only a controlling interest is held, however, it is necessary to take such

Effect on Balance Sheet and Income Statement.[9] The effect of the holding company plan of financing on the interpretation of the consolidated balance sheet and income statements of public utility holding companies is often overlooked by even careful students of accounting and corporation finance. As to assets the holding company has claim only to the residue after the underlying security holders are satisfied beginning with those of the smallest underlying corporate unit and continuing upward through the structure. This is, also, true of earnings as outlined in the preceeding paragraph. The balance sheets and income statements in general use, however, do not ordinarily show this relationship. All secured indebtedness is grouped together although in many cases the stock of underlying companies not owned by the holding company would be preferred as to assets ahead of the holding company bonds except as they shared indirectly through the part of such total issue of stock owned by the holding company. This is, also, true of the income statement where priority of claims is not clearly indicated.

Thus in the analysis of holding company financial statements the principles of trading on the equity should be applied with a careful consideration of the priority claims of the underlying issues both to assets and to earnings, and close attention to the effect of a small variation on the value of the assets or gross income of the subsidiaries upon the income of the company under investigation.

returns out as operating expenses unless the minority stockholders are to share in these contributions.

[9] *See* Paul L. Morrison, "Some Economic Aspects of Public Utility Holding Company Financial Statements," *Journal of Land and Public Utility Economics*, IV (1928), 1-12.

135. Reasons and Causes of Stock Inflation *

I have just one excuse for talking to you on a subject which is quite commonly supposed to be the function exclusively of the financial heads of the corporations and reformers. That excuse is a pretty vital one; namely, that right thinking on the part of the public served in regard to the corporate capitalization, as well as concerning the other phases of our public relations, affects directly every man in public service corporation work, inasmuch as the individual job depends on the success and well being of the industry as a whole. No one of us individually can prosper if our industry fails to prosper, and the industry must fall short of its just measure of prosperity if unfair ideas become current concerning anything so vital as the amount of money on which the company has a right and obligation to earn a return.

What I wish to bring out is that there are many things worse than a certain kind of stock inflation and that much of the legitimate stock-watering of the past was justifiably necessary, in line with the general morals of the age that brought it forth and therefore assented to by the general public. I would like to make it clear that there is such a thing as vicious inflation and that there is, on the other hand, a perfectly legitimate form of stock-watering. In the first class stands the form of thimble rigging manipulation of that kind that might be practiced by the card sharp, whereunder securities are turned out on a printing press over night and the market juggled up and down for the mere purpose of separating the unwary from their money. Standing in contrast to this sort of sharp practice is a genuinely defensible form of inflation—not merely defensible but absolutely necessary unless certain things will be done by the public with reference to its public service corporations. . . .

In the organization of a private concern, it is, practically speaking, permissible to issue securities against the physical equipment of the concern and a great many other things besides, it being recognized that the earning power of the concern is quite as much dependent on its good-will, its personnel, the scheme of general organization, its exclusive position in the manufacture or sale of its commodity, valuable patent rights,

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* Excerpts, John C. Parker, "The Crime of Stock Inflation," a paper read before Baltimore Section Consolidated Gas, Electric Light and Power Co., Feb. 17, 1915; printed in *National Electric Light Bulletin*, II (1915), 155-158.

etc., as on the amount of money that may have been spent in machinery, buildings, and so on. When the stock sold in the market represents some of these important factors on which the earning power depends but which could not be found in a physical valuation, we call that stock ''water'' and are perfectly content that things should be as they are unless some misfortune overtakes the concern.

Now the modern theory concerning public service corporations frowns upon the watering or inflation of securities, and this for a very definite reason which is all right if it goes far enough. The modern idea is that the public service corporation exists for the service of the public, giving the best possible service at the lowest possible price—consistent with a fair return on the capital invested, it is sometimes almost parenthetically added. In other words, the corporation exists under franchise granted by the people and such a grant is a delegation of some of the rights of sovereignty. These rights are never delegated except to be used in public service and it is therefore important that those to whom the rights have been delegated should not make more than a fair earning out of the exercise of these rights; otherwise, some other citizen may object that such functions of the state should have been delegated to him, that he should have been allowed such franchise on which to make exclusive earnings.

Under this philosophy of the creation of public service corporations, it becomes manifest that inflated capitalizations are in no wise different from excessive earnings so far as concerns their practical effect, since with a given actual investment of a hundred dollars, it is a matter of indifference to the promoter whether he earn 5 per cent on two shares of stock issued against the investment or 10 per cent on one share of stock. The public has, therefore, come to insist that public service corporations shall issue dollar for dollar securities against physical investment with no extra capitalization other than the actual cost of organizing the business, nothing being included to cover good-will, earning ability, etc. It is entirely proper that the earning power of a public service corporation to make profits should not be capitalized, since such power is dependent simply on the rates charged and the rates charged are the thing for which the regulation of capitalization is ultimately intended.

Now, one sympathizes with this whole conception of the public service corporation, and one sympathizes with the idea that its existence under franchise differentiates it from the private corporation doing a general manufacturing or merchandising business, but it is quite fair to insist that attention be given to the whole philosophy and not to one part of it. It is just as necessary that the money invested in a property be allowed to earn a fair return as it is that no more than a fair return be taken out of the customers and handed over to the investors, and it is absolutely necessary that one have a pretty definite idea as to what is a fair return.

This is not merely a matter of equity, it is a matter of the necessities of the case. . . . In other words, in making an investment where a man has to take some risk, he is going to insist on a bigger return, a bigger incentive to take the chance.

Now, that was at one time exactly the controlling situation in every public service enterprise that we have to-day. In the earliest days the gas business, the railroad business, the telephone and telegraph business and electric lighting business—every large public service enterprise—was in the highest degree a speculative proposition; indeed, it was quite seriously doubted whether such things as telephones and electric lights were even conveniences of life, or were thought of more or less as interesting scientific toys, and the men who put money into their public exploitation were considered as being more or less foolish. There wasn't any feeling that the railroads would seriously interfere with canal transportation or that the electric motor would come into existence and drive the steam engine off the map. People didn't know whether the apparatus and equipment put into these utilities would last two years, five or fifty; there certainly was no adequate idea of the scope to which any of these businesses could be extended. At least, there was no certainty that half a dozen telephone instruments would be installed in one room in an office building to enable people to talk to the fellow on the floor below or in San Francisco without so much as getting up from the desk chair. In the days when most of the public service corporations were started there was no conception of large scale business, there was no idea that public service corporations were naturally, and of necessity should be, exclusive monopolies; in fact, the actual operation was quite along a different line, quite along the line of cut-throat competition. In the early days of these industries there was no adequate conception—in the nature of things there could not be any dependable guess—as to how long any given enterprise would last before it became unfeasible or was superseded by some better scheme of things; in other words, the promoters of the first railroads and of the earliest gas and electric companies had not the slightest means of knowing whether their utilities would be a transient fad, as was the bicycle, or whether they would remain permanently serious utilities. As a result of all these elements of uncertainty and doubt, these men simply had to play safe.

It was just this element of uncertainty as to getting back the money originally put in, combined with a gambler's risk that there was not going to be any very substantial dividend paid, that made it necessary to issue excess capitalization. The men who started these enterprises were taking a tremendously big risk and they simply would not assume the risk unless they were permitted to take an equal risk of getting a big reward.

The question may be raised as to why the reward for the risk taken—that is, the extra large return on the investment,—might not have been looked for in the form of fat dividends. The answer is perfectly obvious in the light of the present-day attitude toward the earnings of public service corporations. An enterprise might have been promoted on the assumption that it would earn 15, 12 or 10 per cent, if it were successful, but just as sure as fate did any public service corporation show in the sequel those generous earnings which had been used to attract the investor, the identical fact which we recognize today would have come to pass, namely, there would have been an emphatic protest on the part of the public against being ''fleeced.'' The sincere reformer and the demagogue alike would have overlooked the risk that was taken and insisted that the corporations having taken all the risk to establish themselves on a firm basis and demonstrated the practicability of their enterprises, must now do business on the bare minimum of return that might be expected on a sound reality investment. The result is that the promoters found it neither attractive nor safe to wait for an 8 or 1 per cent dividend distributed over a number of years, but insisted on having their incentive to take the chance at a date very early in the game; that certain excess capitalization should be injected into the properties so that in case of shrinkage of the value of securities from any cause, the promoters would still have a reasonable degree of leeway.

This general scheme of an adequate attractive initial reward for any work of promotion is absolutely sound. If the promoters had had merely the opportunity to invest money in the hope of a large stock dividend, then all subsequent investment would have served to cut down the promoter's return for his effort, provided such additional investment were to take the form of stock subscriptions.

There is another way of looking at this matter; namely, that it isn't in human nature to take a very large risk with the expectation of waiting for a very long period of years to get a more or less questionable return. If a man is betting on a sure thing, he is perfectly willing to take a long period to get his money back and to take a comparatively small return; government bonds run for a longer life than do the stakes on a horse race.

These considerations show that it is very likely that most of the public service corporations started in the early days of their particular industry did have some inflated stock, but, by the same token, it is highly improbable that any considerable percentage of such inflation exists in any of the corporations to-day, since the enormous extensions were made after the initial risks had been gotten out of the way, and hence under conditions where capital could be attracted on satisfactory terms. I merely wish to point out that there has been of necessity some stock inflation and that it isn't such an awfully vicious thing after all.

After the pioneer company in the community had made its start, showing a reasonable prospect of making a return on the money invested, and when a few of the original promoters had made a fair thing of their work of promotion, then came the era of wholesale franchise granting when the public body deliberately encouraged competition. Every town has had a taste of the competitive condition when two or more feeble concerns gave bad service at high prices and paid more or less uncertain returns to the stockholders. After a period of this sort of thing, there came along a group of men who, by some means or other, secured the control of the small warring companies and combined them; and as the advantages of this combination came improvements in service, lower rates to the public and fair returns to the stockholders. Please note that this work of consolidation required brains and effort, and would never have been undertaken without the possibility of some direct reward to the men or group of men who made it. If some extra capital were injected into the consolidated concern, it is to be noted that, in general, the real capitalization plus the inflation was of necessity lower than the aggregate capitalization of the warring, inefficient little concerns. The public, then, derived some benefit from allowing the promoters of consolidation to have some share in the rewards as an incentive for their effort in preventing destructive competition—a competition much worse than any stock inflation that ever resulted from it and a competition which had been created by the public themselves.

Here we have then a second reason for excess capitalization in public utility concerns, and one which is chargeable purely and simply to the ignorance of the public in believing that competition is vital to concerns which are natural monopolies.

A third form of excess capitalization which has all the effect of a capital inflation but which arises from an entirely different cause from the two preceding, may perhaps throw a little light on them. I have in mind the developmental expense of getting the physical equipment of a company to its present state of greater or less perfection. There are but few public utilities in the country where the physical inventory would show one hundred cents of present assets for every dollar of stock and bonds, and yet it is quite possible that considerably more than 100 cents have been spent for every such dollar of capital debt. A man unskilled in the work of inventory, looking over the property of a company, will not be able to appreciate the tremendous developmental expense necessary to get a property into operation. I don't mean such legitimate charges as interest during construction, engineering and supervision, accounting for construction, etc., but I mean that actually there have been physical installations made for which money has been spent and which cannot be found in the property today. If one will take any portion of a property where underground lines exist today, it is a fair assumption that territory was served by overhead lines; it is equally a fair assumption that to build up the service and to get the subway in place it was necessary to build a pole line in the earliest stages of the game—that is, the business could not have been got to the density that would justify subway construction without putting up the less expensive temporary structures and keeping them in commission until the business grew to the point where it would pay to retire them. The money spent for such construction may stand on the books of the company today and yet the physical construction cannot be found.

Now, maybe this form of excess capitalization throws some light on the preceding two. It seems to me that deliberate stock inflation as a reward for organization and consolidation is just as much a part of the cost of building up a business organization as was the old narrow gauge lumbering road an essential part of the physical building up of the big trunk system. . . . In other words, the public cannot insist that a corporation shall maintain its equipment in the most efficient state and sell its commodity at the lowest possible price, and, at the same time, reduce its capitalization every time it throws away a piece of obsolete apparatus, unless the public makes some provision for taking care of this obsolescence as it develops and recognizes the responsibility for unamortized ancient obsolescence.

I would like to make one point right here, and that is, that whatever inflation has been put into public utility securities in the past was put there with pretty full opportunity for the public officials to know what was being done; but the public was glad enough to have enterprises undertaken on any terms when there was large risk attached to the undertaking, and did not develop a high moral sense in regard to overcapitalization and large earnings until the fundamental work of development had been undertaken.

For the present generation of public officials to insist on service charges being based on a physical valuation is practically to repudiate the acts of their official forefathers, which is not merely bad sporting blood but is also bad business. The public unfortunately has not yet got through with its use for public service corporations. There are still a few extensions which public service demands that the corporations make, and, so far as these extensions are concerned, the public stands to the corporations more or less in the same relation in which the public stood to the original promoters. The attitude taken with reference to the bargains made in the past will be considered an indication of the value of present agreements, and if, therefore, the corporations are expected to extend their operations the rate-regulating bodies must frankly admit the propriety of some kinds of excess capitalization—must endorse the acts of a previous generation of public officials.

My program for such matters is a very simple one; it involves a little courage and a great deal of honesty on the part of both the corporations and the government bodies. It reduces simply to this: That, in order to get the lowest possible charges for service today and to get every possible reasonable extension of this service to new territory, the public must make it attractive for capital to invest in public service enterprises; but that corporations, on the other hand, must be willing that the public insure itself against exploitation—excellent service must be given at the lowest price consistent with the proper return to capital. A proper return to capital means a return consistent with the risk, and rate making and legislative bodies must permit a very large return unless they will eliminate the risk. A frank acknowledgment of the propriety of some of the undischarged obligations involved by the ancient risks of promotion, consolidation and development, is the surest public policy in creating that confidence in public utility enterprises which will make it possible to borrow ample capital at modest rates to make the necessary extensions. The public can remove a few other elements of risk by making franchise monopolistic, subject to restraints of legislation perpetual during good behavior, and by permitting the corporation to earn a sufficient return for a given period of years to accumulate a fund that will retire all of the investment in case our industry as a whole goes out of existence. These last two considerations are distinctly important. If rate regulation means a bare 6 per cent return and the public service corporation has to make investments running into the millions of dollars with the chance of finding itself afterward in unfair competition with the public through municipality- or state-owned utilities, then public service corporations are not going to extend. Therefore, monopolistic franchise should be irrevocable and run against the state as well as against all other parties.

It may seem absurd to suggest that any given public utility business of today will, as a whole, become obsolete, but I know that a brief survey of the history of the past will show that this is not beyond the range of possibility. The electric service corporation itself is not a thing that is essential; it constitutes merely a means of transmissions or, if you please, of transportation; time was when the electric companies were lighting companies; today the electric company as a lighting company has practically passed out of existence, not, of course, by the process of decrease and decay, but simply by evolution into something quite different. Is it not possible that the power company may itself actually cease to be? I don't pretend to say that these results are probable, but I do say that a public service corporation should be allowed to earn, or rather should be required to earn, a sum of money which shall be allowed to accumulate to make a substantial war fund against just such contingency.

Why all this fuss about capitalization anyhow? . . .

Take just this one feature of the failure to extend the business: If the hampering restrictions of rate regulation, etc., are made so great that capital is not attracted to the industry, then it will be impossible to make the extensions that will raise a company from the 15,000-kilowatt class to the 50,000-kilowatt class. This arrested development will make it commercially and economically unfeasible to install proper apparatus and hence to manufacture at a price sufficiently low to enable low enough rates to get additional business. This very restriction as to capital earnings then may result in forcing so great inefficiency as to keep the rates up to a point greater than any possible stock inflation would necessitate.

CHAPTER XIII

THE RATE OF RETURN

136. Rate of Return *

In approaching the general question of the rate of return which should be allowed to a public utility we may lay down certain general statements which will probably be accepted by anyone familiar with economic and financial conditions.

A certain portion of the capital of any community is constantly open for reinvestment. This capital, which we may call fluid capital, goes always to that business which, after making proper allowance for inherent risk, offers to the investor the maximum reward.

If any given line of business offers an excessive reward, it acquires an undue share of the fluid capital of the community. This excess of invested capital leads to overproduction; competition between sellers for buyers follows; profits diminish; the inflow of fluid capital ceases until such time as the invention of new methods of production or the increase of public demand again increases the margin of profit.

Whenever the reward or rate of return in any business is below the amount which the community regards as normal, fluid capital not only refuses to enter the field but so far as possible withdraws from it. In consequence, production remains constant or shrinks until such time as there is an increase of reward either through the cheapening of production or through an increase of public demand.

Left to itself, therefore, business is regulated not so much by competition for customers as it is by competition for capital. If prices are excessive in comparison with cost, capital flows in and lowers them; if prices are low in comparison with cost, capital refuses to flow in and even flows out until the shortage of production brings about an increase in price.

The distinguishing feature of a monopoly (whether growing

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* Excerpt from *Report of the Committee on Valuation* presented at the Convention of The American Electric Railway Association, Atlantic City, New Jersey, October 3, 4, 5, 6, 1921.

out of the ownership of a patent, the possession of a secret process, the control of sources of supply, or the possession of an exclusive franchise) is that the owners of the monopoly are protected from the inflow of fluid capital and therefore have no maximum limit upon their rate of return other than the ability and willingness of the public to consume the product at the price fixed. . . .

In so far as a public utility is a genuine monopoly it is protected from the inflow of capital, but if its reward is too low its monopoly privileges have no power to prevent the stoppage of capital inflow or even to prevent the withdrawal of capital already invested. In other words, monopolistic powers may keep capital out when the reward is excessive but can neither bring it in nor keep it in if the reward is inadequate.

The average American community is a growing community and its public utilities are in constant need of new capital. Without it the utility must starve and degenerate. If, then, the public utility commission in fixing a schedule of rates provides a rate of return sufficiently high to attract the fluid capital of the community, the public utility will prosper. If the rates fixed by the public utility commission do not provide a reward which the owners of fluid capital consider adequate; or if the operation of the public utility is surrounded by such restrictions, as to make doubtful its ability to earn this reward permanently; or if there is doubt in the mind of the investing community as to the permanence of a sound regulatory policy, fluid capital will not come into the business and the public utility in question will starve and degenerate.

Therefore whatever ethical justification there may be for the fixing of a rate solely by the public utility commission's standard of fairness, the practical fact is that the community which offers reward below the standard of the owners of fluid capital will not continue to receive adequate public utility service.

When a regulatory body fixes a rate of return below the standard set by the investing community, the only way in which the utility can secure necessary funds is to increase the attractiveness of the offering by decreasing the risk or, in other words, by offering bonds or short-terms notes. The latter is merely a temporary expedient; and the former while it offers a chance to pay larger dividends upon common stock in those cases where the bonds are floated at a rate below the allowed rate of return has a tendency to still further depreciate the common stock and render the putting-out of additional stock issues impossible.

Moreover, the constantly increasing ratio of bonded indebtedness to total value renders each new bond issue more difficult to float except at heavy discounts.

This tendency to issue bonds rather than stock is further increased by the action of nearly all public utility commissions in refusing to allow common stock to be issued for less than par, while permitting at the same time the issuance of bonds at whatever discounts are necessary to secure money in the open market. We are not surprised to find that under these conditions the bonded indebtedness of railroads reporting to the Interstate Commerce Commission, approximately equal to the capital stock in 1902, had risen until in 1918 it was over two-and-a-half billion dollars in excess of the capital stock.

From the beginning of corporate life the common stockholder has borne the risk of the enterprise. He has been the first one to feel the shortage of income and, in event of liquidation, the one who first of all was called upon to meet existing deficits. His reward for this assumption of risk has consisted chiefly in the chance of making a correspondingly high return in prosperous years. Net profit, out of which all dividends upon common stock must, of course, be paid, is the essentially variable element of business return.

Any attempt to fix a maximum limit upon the return of the common stockholders, any attempt to change the variable element by placing upon it a maximum limit, however justified it may be as a matter of public policy, nevertheless decreases the attractiveness of the common stock as an investment and must be compensated by a decrease of risk or an increased return. An investor who desires an 8 per cent return may readily put his money into a street-railway property which promises to pay only 6 per cent or 5 per cent for many years in the expectation that eventually the property will pay 10 per cent or 12 per cent. If, however, he is given to understand that as soon as the property passes an 8 per cent basis its schedule of rates will be cut down, the investment in question ceases to interest him.

Moreover, an investor already holding securities of public utilities finding, as in the recent war period, that the return has slumped far below the standard set forth by commissions as reasonable; finding difficulty in persuading regulatory bodies to raise the rate to a sufficient extent to make a fair return; realizing that there is no prospect that the public will consent to a sufficiently high rate in the future to recoup the loss sustained in the war period; and having offered to him standard securities at bargain prices, promptly dumps his holdings of public utility stock upon the market. It is not surprising, accordingly, that the mean price of ten important public utility stocks quoted on the New York Stock Exchange which had ranged from 89 to 106 in the period from 1911 to 1916, inclusive, should have dropped to 50 in 1920. Under these circumstances the flotation of such stocks at par is an utter impossibility.

Conclusions

A public utility in the American city must have three things: material, labor, and new money. For each of these it must go into the open market and bid such sum or price as will turn the supply flow in its direction. The regulatory body may attempt to fix the price which it shall pay for labor, but if it fixes it too low the labor will not be forthcoming; cars will not run, gas will not flow, and electricity will not be generated. The situation with regard to money is exactly the same. If the regulatory body fails to fix a sufficiently high rate of return, the utility cannot purchase its new money and the work which is necessary to the service of the community will not be performed.

The price which the utility must pay for money, and therefore the rate of return which should be allowed by the commission or other regulatory body over and above cost of operation, taxation, depreciation, and other reserves, is made up of three distinct elements:

First: A sum equal to the rate of return on high-grade investments of low risk elements;

Second: An additional sum commensurate with the risk involved in the business, whether that be risk of delayed return, loss of return, or loss of invested capital;

Third: A still further additional sum necessary to divert capital from other investments to the public utility treasury.

This third element is large in periods of financial depression and small in periods of easy money. It represents at any particular time the cumulative effect of the competitive bidding in which various classes of industry must indulge in order to bring to their treasury a sufficient percentage of the available supply of fluid capital.

However valuable and necessary to the public welfare regulation by commissions may be, the fact must be recognized that the mere existence of such regulation acts as a barrier to the flow of capital toward the public utility treasury and therefore necessitates, if the flow is to be maintained, an increase in this third element of cost of money over and above the amount which would be demanded if commission regulation were not in existence. This excess cost, due to commission regulation, can be offset only by throwing around the investment some additional safeguard which will increase the attractiveness of the investment to the general public. Some form of dividend reserve created and maintained to preserve the level of dividends through lean years, or some form of public guarantee that rates will not be disturbed until lean years have been recouped, or some form of public guarantee that changing personnel of the commission will not lower the rate of return allowed below a given minimum, may be taken as illustrations of the sort of compensating attraction which may be used to offset the disadvantages of the regulatory system under which a maximum rate of return is fixed.

Commission regulation, with its accompanying features of valuation proceedings and rate-fixing, has become rather firmly established in our legal procedure in a comparatively short time. If public utilities are to prosper under this system, some way must be found in which to assure the investing public that the money once invested in a public utility will be allowed to earn a sufficient return to pay a fair compensation to the parties who have invested it and to replace or amortize the property in which it has been invested at or before the end of its useful life. If some such guarantee cannot be made, investment in public utilities becomes a speculator's or gambler's proposition and must be offered a speculator's or gambler's return.

Final Statement

The Committee do not desire this report to be considered as opposing regulation, *per se*, but have attempted to point out the dangers confronting the industry and the civic communities served by the industry if the rate of return is not adequate; in other words, if the rate of return is not such that new and additional capital from new investors will readily flow into the industry. The report on this particular subject is occasioned by the fact which is indisputable—that new capital is not now readily available. The facts are that no new money is coming into the industry, except that money which comes from those who have investments already in, and who grudgingly are putting in from time to time a minimum amount of new capital in order to protect the capital already invested. This is done in the hope that a better day will come when it will be realized by all that the rate of return at present allowed is in practically no case attractive, and in many cases is actually confiscatory, absolutely preventing that most necessary inflow of new capital which must be provided in order that electric railways may properly serve their communities.

Two arms of industry absolutely essential to the economic development of any community are transportation and power. The breakdown of either means economic disaster to the business of the community and consequently to individual prosperity. It therefore appears to us most essential that the actual facts in the transportation situation should be brought before the public whom we serve and whose prosperity is to such a large degree dependent upon adequate urban transportation. These actual facts are that practically no new track has been built for many years and that a considerable amount of track has already been abandoned. The street-railway industry and the investors therein have already suffered. From now on, unless an adequate rate of return is allowed, the suffering will fall more upon the community served than upon those who already have investments in the industry. By the phrase "adequate rate of return" we mean a rate of return such as will encourage a reasonable inflow of new capital from new investors. If the rate of return allowed does not do this, it is unquestionably inadequate, and the communities served will suffer all out of proportion to any possible minor gain through temporary lower rate of fare, for over a period of years the industry can better serve any community, and at a lower rate of fare, if given adequate money for improvements.

137. Elements in the Rate of Return *

That the reasonable rate of return is that rate which under normal conditions yields reasonable amounts for interest and profits on the fair present value of the investment appears quite clearly when the meaning and nature of these returns, together with the elements of which they are made up, and the conditions under which they thus become reasonable are more fully analyzed.

The term "return on the investment" as ordinarily used means the amount available (after adequate provision has been made for ordinary operating expenses, contingencies, taxes and

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* Halford Erickson, "Relation Between the Valuation and Rate of Returns Thereon," *Proceedings National Association Railroad and Utilities Commissioners* (1913), pp. 440-446.

depreciation) to meet interest on bonds and dividends to the stockholders or proprietors. When we speak of the ''rate of return'' we ordinarily mean the rate of per cent of this amount to the fair present value of the plant and its business.

The economist's analysis of ''return'' or ''gross profits'' will very likely include the following elements:

1. Interest.
2. Insurance.
3. Replacement.
4. Wages of superintendence.
5. Enterpriser's profit.

In this analysis, ''interest'' is understood to mean ''the pure return to capital,'' a return which is paid to the owner of capital who lends it without any accompanying labor or risk; ''insurance'' is understood to mean payment for risk; ''replacement'' to mean replacement of exhausted capital; ''wages of superintendence'' to mean the compensation by way of salary paid to managing officers; and ''enterpriser's profit'' to mean ''a profit due to wisdom and productiveness of management.''

As a matter of fact, the number of elements to be considered may be reduced to three, namely; (1) interest, (2) insurance, and (3) enterpriser's profit. The others are in usual practice included elsewhere: ''replacement'' of capital is taken care of in allowances for depreciation; ''wages of superintendence'' are properly to be considered a part of salaries and wages which form a part of the cost of production; ''enterpriser's profit'' and ''wages of superintendence'' are frequently treated as though synonymous, but the former term is preferable when speaking of ''pure profit'' as it avoids the danger of confusion with the wages of labor.

Before a regulating body can pass upon the rate of return to be allowed, it must consider to what extent the rate meets the three factors. Each factor must be analyzed in order to do justice to all parties. The importance of analyzing these factors is emphasized by the fact that modern industry tends to become more and more complex.

Before the advent of the modern corporation and the present facilities of credits the capitalist and the employer were one and the same person. Under these conditions there was no very good reason for separating the compensation of these two factors. Since the advent of corporations, systems of credits and other modern conditions, all this has changed. Today a condition has developed under which business is largely carried on with borrowed capital. Those who furnish the capital receive interest thereon. Those who borrow it and use it in their business pay the interest, and, as compensation for their services of management and the risks they assume, receive profits or the surplus above the expense. This condition has led to a separation of the functions of the capitalist and the employer and to a more complete analysis of the compensations which each of these two factors receive.

INTEREST

Interest is commonly defined as the payment made for the use of or control of capital. The economic reason why interest is paid for the use of capital might be summed up in the axiom that capital is a means of production.

In order that some persons should have a surplus to lend there must have been on their part a saving of capital which in effect is equivalent to abstinence from present enjoyment of that capital. Of course, some saving will continue even without any inducement of special reward but as a general rule people will not save and permit their savings to be used in productive enterprises unless they get some return upon their sacrifices. The return demanded is interest. Thus interest is sometimes spoken of as the reward of abstinence.

The rate of interest which the lender of capital can get, ignoring the elements of risk and profit, is dependent upon the rate of interest paid on absolutely safe securities. Such a rate of interest may be illustrated by certain forms of government bonds, savings bank deposits, etc. The rate paid will probably not be more than 3 or 4 per cent.

In order to earn a higher rate, investments must be made in enterprises involving more or less risk and uncertainty and more or less supervision by the investor. It is this class of investment that we have most to consider. Here the rate of interest is determined largely by conditions of demand and supply.

The demand varies directly with the productive use of capital and the rate will depend upon the gain to be had from the least productive use of that capital. In more general language, a demand for capital is encouraged by newness of country; by times of general activity of business; by low rate of interest; by progress of inventions and of the arts calling for more and more elaborate plant; and by growth of population.

So far as the supply of capital is concerned it is an economic fact that this varies with the rate of interest. This is but another way of saying that when the rate of interest is high, there will be more saving of capital to be turned over to productive use.

There is a normal rate of interest which is governed by a more definite rule.

This rule is stated as follows:

"The normal rate of interest is such as will cause an equilibrium of supply and demand and depends like the normal value of a commodity upon the demand of the marginal consumer and the sacrifices of the marginal producer."

These principles apply more particularly where there is free competition, but even where their operation is limited by regulating laws still their influences are felt and must not be overlooked.

INSURANCE AGAINST RISKS

The greater the risk involved, the higher rate of interest will the investor demand in order that in event of loss, the net loss to him may be reduced to a minimum. A few typical risks are mentioned as follows:

1. Danger of mistakes and accidents in period of construction.
2. Possibility of technical failure—where the investment of capital does not produce the physical result expected.
3. Industrial progress rendering original equipment and methods obsolete and unprofitable.
4. Overproduction.
5. Contraction of credit.
6. Hazards in the productive process making damage to persons and property a menace.
7. Newness of the country and consequent unsettled conditions.
8. Failure of city's population to grow as expected.
9. Action of local authorities.
10. Changes in fashions or public wants.
11. Competition with other products.
12. Fixed character of certain forms of capital and inability to withdraw from unprofitable business.

Such risks as depend primarily upon competition are of less importance in the case of public utilities since they are in the nature of monopolies.

But there are in public utilities as well as in other undertakings other than competitive risks. Among the risks that are incurred by the public utility operator may be mentioned the following: liability of mistakes in construction; danger of accidents in operation; the diversion of the growth of the city in a different direction from that expected when the plants are built; the failure of the city to grow as rapidly as expected or as rapidly as the plant had made preparations for; the failure of the city to grow at all, as well as decreases in population and industries; actions of the local and other authorities by which unprofitable extension may be required, the rates reduced, or other burdens imposed.

Enterpriser's Profit

Enterpriser's profits have their source in the business ability, skill, and foresight of the management of the capital invested.

Some writers characterize the enterpriser as the "economic buffer" who bears the shock and brunt of losses if there are any and who enjoys the benefit of manager's profits if he can create them.

To exercise the functions of an enterpriser a man must have high abilities. Some of the important qualifications would be: (1) a technical knowledge of methods, processes, and materials; (2) ability to judge men, and tact in dealing with them; (3) unusual foresight and ability to form a large commercial policy; (4) ability to command financial resources; (5) organizing ability of the highest order.

The rate of profits for the reward of management will vary not only with each industry but with each individual as well. The rate depends a good deal upon the general progress of society. "If industrial society is progressing and if in each period there is more wealth to be divided among the sharers in distribution than in the preceding period, a large part of the increase will appear temporarily as extra profits going to enterprisers." In the same way when industrial society is retrogressing the loss falls first upon enterprisers.

If there were no prospect of a substantial gain in case of success, no one would be likely to exchange the assured income of the laborer or capitalist for the hazards assumed by the active business manager.

Reasonable Rate of Return

In a general way, the reasonable return may be said to be that rate of return at which capital and business ability can be had for development.

It has been defined as follows:

> A reasonable profit to people who invest their money in any business is that amount of profit which will bring to the business fully the amount of money which it needs; neither more than that, nor less than that.

"Reasonable rate of return" is a relative term. There is no rate that is absolutely standard for all cases. Each investigation must be gone into with the purpose of determining what rate is reasonable in view of any special circumstances that may exist. The rate of return usually realized upon investment of a somewhat similar nature, *i.e.* in plants of about the same size and location will be a guide in passing judgment but is not necessarily the rule.

The usual standard followed for measuring the reasonableness of rates is such a rate as would under present conditions be necessary to induce investment in a new enterprise of about the same character. Whatever rate of return is determined upon, this rate must be sufficient, under all the circumstances, in each case to attract capital to that individual or class of enterprise.

To obtain some indication of the extent of the risk and work of management involved in a public utility investment, it is customary to make a study of its securities. If the securities do not sell at par, inquiry should be made into the local conditions that may have caused the discount.

The whole subject of "reasonable rate of return" might well be summed up as follows:

The rate of return is properly divisible into three elements, interest, insurance against risk, and profits. Interest proper should include only the amount that is paid for the use of the capital employed; insurance against risk should be such an amount which if added to pure interest will compensate the investors for such hazards as they may take; and profits consist of the wages of management, broadly interpreted, of compensation for the responsibilities that must be borne by the employers. These elements, when taken as a whole, that is the rate of return that is allowed on the fair value of the investment, in the long run, must be high enough to attract the necessary capital and business ability into public utility enterprises.

While under normal conditions the proper relation between the valuation and the rate of returns thereon is that relation which obtains between them when these returns are high enough to yield reasonable amounts for interest and profit on the fair present value of the plant and its business, the conditions are not always such that this relation can be maintained. Some plants are so situated that they do not earn enough and cannot be made to earn enough for this purpose. Their otherwise fair value is not supported by their earning power and is therefore less than normal. Financial tangles and other ill-adjusted situations can also at times be much more easily straightened out on the basis of higher than normal values even though offset by lower rates of returns, than on the basis of normal values and returns. In order to avoid receiverships and loss of service in cases where the bond issues alone exceed the normal value, it may also be necessary to keep up the valuation at the expense of the rate of returns, at least until needed readjustments can be effected. Conditions of this kind, however, are rather exceptional and should be dealt with on their special facts.

138. Pertinent Provisions of the Transportation Act *

By the Transportation Act of 1920 the Interstate Commerce Commission is authorized and directed to prescribe just and reasonable rates which ''will, under honest, efficient, and economical management and reasonable expenditure for maintenance of way, structures, and equipment, earn an aggregate annual net railway operating income equal as nearly as may be to a fair return upon the aggregate value of the railway property of such carriers held for and used in the service of transportation.''

This general statement of the doctrine of a fair return upon the fair value is made more specific and definite in paragraph 3 of section 15a. The Commission is ordered ''from time to time to determine and make public what percentage of such aggregate property value constitutes a fair return thereon and such percentage shall be uniform for all rate groups or territories which may be designated by the Commission.'' Then follows another provision which implies full legislative recognition of the relationship between the rate of return and railway credit. This relationship between the problem of attracting capital to the industry and the rate of payment for such capital is an interesting one and one which, although often expounded by the courts, is put into statutory form for the first time in this

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* Excerpt H. B. Dorau, "The Cost of Railway Capital under the Transportation Act of 1920," *Journal of Land and Public Utility Economics*, III (1927), 2-4.

Act. In this Act, Congress orders the Commission to "give due consideration, among other things, to the transportation needs of the country and the necessity (under honest, efficient, and economical management of existing transportation facilities) of enlarging such facilities in order to provide the people of the United States with adequate transportation."

The passage of the Transportation Act of 1920[1] is sufficiently significant to mark that date as the end of one period in the history of federal regulation of railways and the beginning of another. This Act introduced into the scheme of federal regulation some radical departures from previous law and policy. One student of the subject states that this Act amended in some respects nearly every section of the then existing Act to Regulate Commerce.[2] For the first time Congress provided, among other things, that the Interstate Commerce Commission shall have the power to regulate the issuance of railroad securities and stated also a definite legislative rule of rate-making. Both of these provisions are of peculiar interest and importance in the study of public utility finance.

The provisions for regulating security issues, and the incidental rules and regulations of the Interstate Commerce Commission in its application of the Act, have provided a body of information concerning railway financing previously unavailable and, for the industry as a whole, unknown. The legislative rule of rate-making sets forth the basis for determining, within certain limits, the actual rate of return to be received by capital in the industry or such divisions of the industry as the Commission may make. The rate of return to be allowed capital in the railway industry is a matter of considerable importance in railway financing due to its bearing on the amount of capital which will be used to provide transportation facilities and the price at which that amount will be available.

The Act definitely fixed the fair rate of return for the first two years[3] at 5½ per cent, giving the Interstate Commerce Commission the discretion, however, of adding not to exceed ½ of 1 per cent to make provision for capital expenditures chargeable to the capital account. The rate increases granted in 1920 were intended to yield a return of 6 per cent. On March 1,

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[1] The Act was approved by the President and became law February 28, 1920, just one day before becoming effective.

[2] W. J. Cunningham, *American Railroads: Government Control and Reconstruction Policies* (Chicago: A. W. Shaw Company, 1922), Chap. XX, p. 220.

[3] From March 1, 1920, to March 1, 1922.

1922,[4] the commission, exercising its discretion under the law, fixed 5¾ per cent as the fair rate of return.[5]

It is important in this connection to understand that the rate of return as fixed by the Commission does not apply to individual roads, but only to such regional groupings as the Commission may have designated as desirable and necessary to carry out the Act. Thus the rate of return actually earned by any one road might be very different from the rate allowed to the carriers of the region as a whole or from that earned by other carriers in the same region, depending, first, upon whether the rates established for the region actually resulted in the desired rate of return on the total value, and, second, upon the relative efficiency and all other factors affecting the income of a particular company.

Further provisions of the Act were intended to limit this variation in the rate of return, at least when in the direction of a higher return. It was provided that if a carrier earns in excess of 6 per cent on its property value, one-half of such excess is to be paid into a reserve fund maintained by the carrier, which may be drawn upon in years when earnings do not equal 6 per cent for the purpose of paying rentals, interests, and regular dividends. After this fund equals 5 per cent of the property value, the carrier's portion of excess earnings may be used for any lawful purpose. But one-half of the excess earnings over 6 per cent shall be paid to the Commission, which is empowered to administer the contingent fund to be built up in this manner. Higher rates of return are thus possible, but it is interesting to note the number of companies reporting excess returns. Out of 798 companies reporting to the Commission in the calendar year 1924, only 22 reported excess income. In 1923, 47 out of 874 reports showed excess income. The amount of such excess income reported was $6,830,374.87 in 1923 and $1,182,221.97 in 1924. The Commission warns in its *39th Annual Report* that the excess income reported was not computed upon values fixed by the Commission and that final adjustments may show very different results. The bulk of the payments made by these carriers were made under protest, and, even though section 15a was upheld as constitutional by the Supreme Court,[6] administration of this provision has been so difficult that no more definite information than this is available on how many carriers are experiencing rates of return in excess of 6 per cent.

[4] 68 I.C.C. 676. [5] Under authority of paragraph 3 of section 15a.

[6] Dayton-Goose Creek Case, 262 U.S. 456 (1924).

139. The Hope of Reward *

If a hope of reward serves as a desirable stimulus to one man, it will have a similar effect upon a business in which the energies of a number of men are combined. Business is very sensitive to opportunities for profitable expansion as it is also apprehensive of possible burdensome restrictions. If the profits from business undertakings are in large part taken from the owners through taxation, or are kept within closely prescribed limits, the incentive for ventures into new fields and for aggressive developments and refinements in existing activities is destroyed. It matters not that such new activities might be of great or even revolutionary advantage to the world through new processes or commodities or lower costs of existing ones; the attendant risks will not be taken without the possibilities of unfettered commensurate reward.

In the pioneer days of steam railroads lines were pushed out into or through vast uninhabitated areas in the hope that, after the inevitable years of losses, a liberal measure of compensating profit would follow. Why has railroad building in the United States virtually ceased during the last generation? Not because all actually or potentially productive sections have been reached, but, rather, because the undiscerning hand of regulation has withdrawn the possibilities of reward which alone appeals to hardy, adventurous spirits. A return of not more than 5 per cent upon investments in uncertain ventures has no appeal to a prospector who scorns the placid security of a savings bank.

Illustrations might be multiplied, almost without limit, of the steady encroachment of restrictive regulation in the field of commerce and industry, accompanied in most cases by withdrawal of incentive for aggressive activity, and followed by a spiritless conservatism which no longer seeks or expects anything more than conventional compensation for a standardized product. Progressive business, as well as red-blooded American citizens, will not be satisfied with such stifling of their ambitions and hopes of reward. They will either destroy the unwise restrictions or, failing this, will withdraw to other fields not yet touched by the leveling process. It is to be hoped that the first course will prevail.

This is not a condemnation of public regulation, but only a

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* Excerpts L. R. Nash, "The Hope of Reward" (Reprinted from the *Electrical World* of March 10, 1923), *Stone and Webster Journal*, XXXII (April, 1923), 400-408.

criticism of certain phases of it in which the phenomena above discussed have been in evidence. Those of use who are engaged in the public utility field have not yet realized the results of the standardization of regulatory methods which is gradually becoming effective. The public service field is still comparatively new, and the pioneer spirit and enthusiasm for progress have not yet yielded to conventionalizing influences. However, if the influences continue, the yielding is inevitable.

A more specific statement with respect to regulatory methods as applied to public utilities is now necessary in order that the corrective measures which this paper proposes may be more intelligently considered. The most common exercise of regulatory powers is in the fixing of rates. The almost universal rule is that rates should be sufficient to cover the cost of the service rendered, including operating expenses, taxes, depreciation, and a reasonable return upon the fair value of the property employed in the service. It is customary to accept actual operating expenses and taxes and perhaps retirement annuities, if or when they have been shown to be reasonable.

When, however, the value of the property and the proper rate of return thereon are considered, the commissioners are apt to abandon specific inquiries and adopt a standard procedure. For example, a uniform return of 8 per cent may be declared reasonable, at least for utilities of a particular kind, without due regard for the risks of the particular enterprises and the efficiency with which its operations are conducted. Operating ratios of public utilities may differ by as much as 25 per cent under apparently similar conditions; the return demanded by investors may vary an even greater amount. In either case the difference may be due, in large part at least, to business skill or the lack of it in the management of the properties. It does not seem reasonable to permit widely different rates for different utilities when the entire difference may be due to varying skill in the construction or handling of the properties. Under competitive conditions no such variation in charges would be possible, for the business under higher rates would soon disappear.

Under regulation, which is merely a means of securing competitive results in monopolistic business, such differences could be adjusted by establishing a reasonable standard of business skill, presumably materially higher than that of the least efficient company and assuredly lower than the most efficient. A premium for efficiency and a penalty for inefficiency would thereby be created, serving a very useful purpose. Both penalties and premiums would lead to better results, with the weight of advantage in favor of the premiums. Without them there is lacking a natural, sustained incentive for improvement. Public utility executives will not in the long run make strenous efforts to improve and expand their service if all the benefits derived therefrom are taken away from them and given to others. Why should they worry about lower cost and greater volume of business which do not add to their profits? Eighteen holes of golf on pleasant afternoons will prove much more interesting to them than saving a tenth of a pound of coal per kilowatt-hour for the benefit of their patrons.

That this principle is of broader application may be seen in an assumed case of a reasonably efficient street-railway of the conventional type. An investigation shows that by the purchase of one-man cars the service of this railway can be improved and operating expenses reduced enough to pay a return on the added investment and provide a margin to amortize the investment in superseded two-man cars. If the proposed change in cars were made, a rate case might be brought and a finding made limiting operating costs to the new basis and the rate of return to the conventional amount on the "used and useful" property, excluding the unamortized superseded equipment. Surely with such possibilities there is no incentive to give better service, but, rather, a risk of serious loss.

If the above illustration is considered as extreme or unusual, a simpler and more conventional one may be substituted. Our assumed street-railway, after strenuous past efforts to raise its power station efficiency to the maximum possible limit, with no heat unit escaping without the closest scrutiny, may awaken to the fact that the kilowatt hours so zealously produced are being handled rather carelessly after they leave the switchboard. It may find that, through a moderate investment in power-measuring devices on its cars, it can save 10 to 20 per cent of its entire station output. But the installation of these devices calls for some new money and also for a clerical and supervisory force which, if results are to be accomplished and maintained, may disturb the peaceful routine of some of the veterans on the front end of the cars and cause other annoyances. Why bother with the thing at all if the savings are all passed along to the other fellow? These and other more routine refinements in operating costs offer no advantages to the utility if they are to be wholly passed along to patrons through rate reductions as soon as they are discovered.

One more illustration, in this case from actual experience, may be cited to make clear the broad application of this principle to public utilities. Not long ago a large company became convinced, after careful investigation, that welfare activities and a program of death and disability payments would be a good investment through the increased efficiency and improved morale of its employees that would follow. After the company had spent considerable money in studying the plans adopted by other companies and in working out its own plans in the light of the most successful experience elsewhere, but before putting them into effect, its rates were the subject of an investigation by the public service commission. In its findings in the case, the commission excluded from the cost of service all charges relating to the proposed welfare and pension program on the ground that such expenditures should not be reimbursed by customers unless or until the program had been put into effect and had proved profitable. It is not hard to forecast the policy of other utilities under the same jurisdiction with respect to such matters, however helpful they might think the final results would be to company, employees and public. With their own initial investment in jeopardy and no ultimate financial gain possible, the unanimous verdict would be "nothing doing."

The situations here illustrated are perfectly analogous to that of the individual who is assured of a standard wage so long as he renders reasonable service. In either case service would be better or greater if the reward were in proportion to the effort and ability to serve. The remedy in the case of the individual is simple in principle, although it involves practical difficulties of application. A suitably adjusted reward for business administration of a high order is not so simple in principle, although it has possibly fewer difficulties of actual application.

A number of regulatory commissions have reduced the authorized return upon public utility property as a penalty for mismanagement or inefficiency. A few others have commended unusual administrative ability as being worthy of reward but have not put the reward in tangible form. The suggested method of award has usually been a higher rate of return, and this appears in imperfect form in several service-at-cost franchises and in the so-called "sliding scale." A greater refinement in this factor might include the value of the property on which the return is based, with particular reference to the basis of valuation and certain intangible elements which are often subjects of controversy. Another real incentive would be found in the establishment of a standard of operating cost, the savings under which would belong wholly or in part to the utility.

The difficulty attending the practical application of such an incentive program lies in the exceptional ability, good judgment, and intimate knowledge on the part of the regulatory bodies required for its equitable adjustment in each of the many and diverse cases which would arise. One of the state commissions has recently developed an interesting system of grading public utilities. This system, which furnished the original motive for this paper, sets up an extended list of factors and elements which are concerned in the furnishing of satisfactory service to the public. The items are given varying weights, depending upon their importance, in determining the final standings of the various utilities. The system has the imperfections to be expected in a pioneer effort of its kind, and the purposes of the grading have not been disclosed. It is doubtful if any system of rating can be devised which would even approximately measure the over-all excellence of a complex business. The more complications are encountered, the less opportunity there is for helpful application of rules and formulas and the greater the need of broad, unrestricted judgment.

In spite of these fundamental limitations to a rating or merit system, the increasing need of it in the public utility field justifies a most careful study of its possibilities by all regulatory commissions and its tentative application at an early date. Regulation is still in its development stage and the commissions have much to learn from the results of their past practices before a stable, consistent policy can be established. With due reference to the earnest efforts of the commissions to deal justly with both public and utilities, it is submitted that too many restrictions have been placed upon values and returns thereon in rate cases. This element in the cost of service amounts ordinarily to from one-fourth to one-third of the total cost. A variation of 10 per cent in this element has a negligible effect upon the bulk of the utility's patrons. For customary individual or home service it would amount to less than ten cents per month. On the other hand, this difference may in the aggregate mean to the utility good credit instead of inability to meet all capital needs, liberality in making service extensions instead of delays and restrictions, satisfactory and reliable service instead of breakdowns and irregularities, and, finally, an incentive to improvements and progress instead of discouragement and stagnation. Surely these differences are worth much more to customers than their trivial cost, and a recognition of this fact by the commissions would be of advantage to all concerned.

An increase in the rate of return by 1 per cent, or even less, in a few merited cases as a reward for earnest and successful efforts to render excellent service, and the recognition of such proceedings as a tentative standard by commissions generally, would go far toward reviving the old pioneer courage and aggressive spirit of the operators and to inspire new interest on the part of investors. Good public utility service is vital to any live community, and should not be withheld for lack of a reasonable hope of reward.

140. Rate of Return to Capital *

. . . No matter what rate base is chosen, the return on the capital invested must be sufficient to maintain the credit of the corporations and to attract new capital to public utility enterprises. This requirement cannot be compromised, for utility enterprises under regulation depend not upon surplus earnings for expansion purposes, but at all times depend upon the investing public. It may appear upon first consideration that the rate base is comparatively unimportant, provided only a sufficiently high rate of return is allowed in order to meet competitive capital charges and maintain the credit of the corporation. In a purely abstract way, this may be correct; but in practice the actual rate allowed is beyond doubt greatly influenced by customary figures, regardless of their adequacy to meet conditions in the capital market. Although starting from some method of valuation of property to secure a rate base, commissions have usually attempted to secure a valuation which when combined with a given rate will be sufficient to meet competitive requirements. Although under prevailing judicial decisions this has been the only course open to commissions, it must be emphasized that it does not constitute a sound basis for rate-making. It rests too much responsibility upon the commissions which are bound to steer clear of the rock of too high rates on the one hand and confiscation on the other. The rate of return allowed really means nothing under the present situation of an elastic rate base.

In spite of the unsound rate base at present required, the courts have in general proceeded along sounder lines with reference

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* Excerpt from John E. Kirshman, "The Principle of Competitive Cost in Public Utility Regulation," *Yale Law Journal,* XXXV (May, 1926), 805-924.

to the rate of return allowed on the property devoted to the public convenience. They have quite generally insisted upon the competitive principle as the measure of the rate of return. In Willcox *v.* Consolidated Gas Company [1] the Supreme Court recognized the two broad principles that lie at the bottom of a reasonable rate of return. It pointed out that local money conditions and the risk of the individual enterprise compared with other enterprises were the determining factors in a reasonable rate. It compared the risks in the gas industry in its early days with the comparative security at the present time, indicating that a reasonable rate would have been much higher in those early days than at present. The principle is stated more in detail in the following extracts:

> A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[2]
>
> It has been held that no rate of return can be deemed reasonable which is not high enough to attract capital to the form of investment involved in utility properties, such as complainant's.[3]
>
> There is a hazard attached to a utility investment which has no guaranty of a return, that does not attach to a well-secured real estate mortgage and it is entitled to a return to compensate it for that risk. . . .
>
> In addition to the normal hazards of business a utility has over it at all times the risk that some State or Federal Commission may make a mistake and compel it, for a time at least, to operate at a loss.[4]
>
> Again, telephone companies must grow on an ever-increasing scale in order to meet the demands of the public for service. Under the theory that only a fair return is permitted upon the property used and useful in giving public service, the utility must make extensions

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[1] 212 U.S. 19 (1909), 29 Sup. Ct. 192.

[2] *Bluefield Water Works and Improvement Co.* v. *Public Service Commission*, P.U.R. 1923-D 11; 262 U.S. 679 (1923).

[3] *Alton Water Co.* v. *Illinois Commerce Commission* (1922, S. D. Ill.), 279 Fed. 869.

[4] *Southwestern Bell Telephone Co.* v. *Public Utility Commission* (1924), 115 Kans. 236, 223 Pac. 771.

> out of new capital. Unless money representing the investment in the property already made is earning a reasonable rate of return, commensurate with the going rate for money invested in property of approximately like risk, new money cannot be obtained.[5]

In Ames *v.* Union Pacific Railroad Co.[6] the court strongly emphasized the necessity of doing justice to investors in railroads. In the Lincoln Gas case [7] the court said: "Annual returns on capital and enterprise the world over have materially increased, so that what would have been a proper rate of return for capital invested in gas plants and similar public utilities a few years ago furnishes no safe criterion for the present or for the future." Finally, the memorandum of the commissioner in the Southwestern Bell Telephone case [8] before the Kansas Supreme Court may be cited as an expression of a sound attitude:

> A public utility . . . must run the gauntlet of good and bad times, strikes, fires, and revolutions in the arts. . . . In addition to the normal hazards of business a utility has over it at all times the risk that some state or federal commission may make a mistake and compel it, for a time at least, to operate at a loss.

The importance of allowing a liberal rate in view of competitive conditions in the capital market is further emphasized by the refusal of the courts [9] to allow deficits incurred through insufficient rates in the past to be subsequently made up. On the other hand the Interstate Commerce Commission [10] works on the principle of average rate of return in good and bad years.

While the decisions and opinions above cited show clearly that the courts work on the principle of competitive cost of capital in fixing a rate of return, they nevertheless fail to carry the principle to its logical conclusion. The principle of competitive capital cost demands only that the return shall be sufficient to meet the conditions of the market at the time the securities are being floated. Contracts once made remain unchanged, and a return sufficient to meet the contract requirements will always be adequate. As each new issue of securities is floated care must be taken that the future earnings will be large enough to meet the new costs incurred.

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[5] *Re Mountain States Telephone and Telegraph Co.* P.U.R. 1922-E 293.

[6] (1894, C. C. D. Neb.) 64 Fed. 165.

[7] *Lincoln Gas and Electric Light Co.* v. *City of Lincoln* (1919), 250 U.S. 256, 40 Sup. Ct. 585.

[8] Supra note 4.

[9] See *Bluefield Water Works and Improvement Co.* v. *Public Service Commission*, Supra note 2.

[10] *Re Advances in Rates, Eastern Case* (1911), 20 I.C.C. 243; *Western Case* (1911), 20 I.C.C. 307.

The application of these principles has in practice led to different rates of return on the property, as might be expected. In pre-war days the courts had quite generally come to the conclusion that a return of approximately 6 per cent on the depreciated value of the property was non-confiscatory and reasonable.[11] In some cases the rate varied somewhat from this figure, owing to local conditions or special circumstances. For several years following 1920, the courts quite generally regarded a rate of 8 per cent as reasonable.[12] The commissions [13] also have quite generally acted on this basis. Within the past two or three years, however, there has been a distinct tendency to reduce the rate of return to a point below which confiscation would result. In the Mystic Valley Water Company case [14] the Connecticut Public Utilities Commission said 5 per cent was reasonable. In the Ohio Utilities Company case [15] the Supreme Court of the United States said that less than 5 per cent was confiscatory. In the case of the Chesapeake and Potomac Telephone Company [16] the federal court said 6 per cent was not confiscatory, while 5½ per cent was considered too low in the case of the Northwestern Bell Telephone Company.[17] Seven and one-fourth per cent was declared non-confiscatory in the Georgia Railway and Power case [18] while 7 per cent was just and reasonable in the Rockford Electric Company case [19] before the Illinois commission. On the other hand, many cases can be cited showing that 8 per cent is still adhered to. The North Dakota Railroad Commissioners [20] decided that the Mandan Electric Company was entitled to 8

[11] *Willcox* v. *Consolidated Gas Co.*, Supra note 1; *Cedar Rapids Gas Light Co.* v. *Cedar Rapids* (1912), 233 U.S. 655, 32 Sup. Ct. 389; *Des Moines Gas Co.* v. *Des Moines* (1915), 238 U.S. 153, 35 Sup. Ct. 811; *Lincoln Gas and Electric Co.* v. *Lincoln*, Supra note 7.

[12] *Brush Electric Co.* v. *Galveston* (1923), 262 U.S. 443, 43 Sup. Ct. 606; *Louisiana Water Co.* v. *Missouri Public Service Commission*, P.U.R. 1924-C 293; *Re Bronx Gas and Electric Co.*, P.U.R. 1923-A 255.

[13] *Re Georgia Railway and Power Co.*, P.U.R. 1921-A 165; *Re Lansing Fuel and Gas Co.*, P.U.R. 1923-C 348; *Re Northwestern Ohio Light Co.*, P.U.R. 1924-B 762; *Re Appalachian Power Co.*, P.U.R. 1923-E 221.

[14] *Re Mystic Valley Water Co.*, P.U.R. 1925-D 385.

[15] *Ohio Utilities Co.* v. *Public Utilities Commission of Ohio*, P.U.R. 1925-C 599.

[16] *Chesapeake and Potomac Tel. Co.* v. *Whitman*, P.U.R. 1925-D 407.

[17] *Lincoln Division, Northwestern Bell Tel. Co.* v. *Spillman*, P.U.R. 1926-A 330.

[18] *Georgia Railway and Power Co.* v. *Georgia Railroad Commission* (1921), 262 U.S. 265, 43 Sup. Ct. 680.

[19] *City of Rockford* v. *Rockford Electric Co.*, P.U.R. 1925-D 154.

[20] *Re Mandan Electric Co.*, P.U.R. 1925-D 508.

per cent return. The Rhode Island commission[21] used 8 per cent in the case of the Narragansett Electric Light Company as a basis of calculating losses. The New York commission allowed 8 per cent in the case of Peekskill Light and Railroad Company.[22] The Missouri commission said 8 per cent was reasonable for the Capital City Water Company.[23] The federal court in the case of New York and Richmond Gas Company[24] has just pointed out that in that part of the country gas companies have been allowed to earn 8 per cent, and that this was necessary to enable the corporations to attract sufficient new capital for extensions and development. Those decisions doubtless, to some degree at least, reflect changing conditions in the money market, as well as modifications for local factors, individual credit of the company, and the like. But to one who has even a casual acquaintance with money market conditions the country over many of the differences are irreconcilable on economic grounds. Moreover, rates based on valuation figures apply to securities outstanding, regardless of contracts requiring stipulated interest and dividend requirements. Enormous sums of capital have been borrowed since 1920 for the development of the public utility business. These sums of necessity were borrowed upon high interest rates; and contracts were undertaken, in most cases under the eyes of the commissions, for years in the future guaranteeing a high return to the holders of those issues. Reduction of rates regardless of contracts outstanding will work injury to these security holders. Capital, like labor and management, demands only the return specified in the contract as the price of its service. In the end it will secure this or it will, like labor and management, withdraw from the field and leave the public without service.

Capital Market. The pressing need of regulation is conformity to the modern highly specialized capital market. Originally the capital market was simple and local in character. A knot of friends possessing capital would associate themselves together, pooling their resources in a common undertaking and each assuming the same risk, exercising a voice in the management, and receiving the same reward. The stockholders of the early corporation were to all intents and purposes partners. In this stage of the development of financial organization, the ownership and control of business enterprises were in identical hands.

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[21] *Public Utilities Commission* v. *Narragansett Electric Light Co.*, P.U.R. 1925-D 545.

[22] *Peekskill* v. *Peekskill Light and Railroad Co.*, P.U.R. 1925-D 593.

[23] *Re Capital City Water Co.*, P.U.R. 1925-D 41.

[24] *New York and Richmond Gas Co.* v. *Prendergast*, P.U.R. 1926-B 759.

But when business grew to such size that local funds were insufficient to meet requirements for expansion, capital had to be sought from distant sources, in many cases even from abroad. This introduced a division between the owners and managers of capitalistic enterprises. Stockholders residing at a distance became in reality only investors, since although legally they were still the owners of the business, in fact they lacked practical possibility of exercising any influence upon the management. On the other hand, local stockholders, serving as directors and officers, managed the business. With this stage of development the corporation became a distinctive institution totally different from the old partnership relation. Investors emerged as a distinctive type, performing a specialized function. This class of pure investors has continued to grow, until today it constitutes the larger part of the capital market. It is this market to which public utility enterprises have to appeal for funds in competition with other enterprises as well as with civil bodies.

The capital market itself has become refined in character. The leading types of issues of public utility operating companies, outside of railroads, are mortgage bonds, debenture bonds, preferred and common stocks. Mortgage bonds are adapted to those desiring to assume only the minimum amount of risk. These issues hold a position of priority of claim as to assets and earnings of the corporation. Their holders in return for this privilege are content with a comparatively low rate of return. Debenture bonds and preferred stocks are purchased by those who are in the habit of assuming business risks. The claims of debenture bondholders and preferred stockholders are junior to mortgage bondholders, but offer larger return on the capital thus invested. The common stock of public utility corporations is in a different position from the common stock of industrial enterprises. It is in effect a sort of junior preferred stock, because its income is definitely limited by the fact of regulation. Ordinarily common stockholders in industrial enterprises expect a substantial, if not the greater, part of their reward to come from residual earnings, surpluses, extra and stock dividends, and the like. None of these is likely in the utilities. On the contrary the common stockholder expects for the most part in return for his acceptance of the weakest position of all security holders, a higher rate of return in regular dividends, with possibly some increase in value due to surplus earnings. He has the right to expect that in ordinary times the earnings will be sufficient to cover the requirements of operating expenses and senior capital charges with enough remaining to pay regular dividends on the common at a given rate. In return it is primarily he who accepts the risks of fluctuating business conditions, wars, calamities, wage demands, and even of regulation itself.

Thus properties as such do not compete with each other in the modern capital market as they once did. On the contrary, mortgage bonds of public utilities find themselves in competition with mortgage bonds of other enterprises, with farm and real estate mortgages, and even with civil loans. The amount of assets in relation to the amount of mortgage bonds issued must conform to the accepted standards of safety. So also the margin of earnings over interest requirements for these issues must follow standards recognized in the banking field. If a 50 per cent margin for assets over the bond issue and 75 per cent of earnings over interest requirements are demanded, these standards must be recognized in financing under regulation. Similarly, accepted standards for debenture bonds and preferred stocks must not be ignored if public utility enterprises are to get their portion of current capital funds. Standards for common stock have been fairly well developed through experience in the railroad field; and these may be taken as the guide for other types of public utilities. The precise margin of earnings over dividend requirements is not of great importance in this connection; but a considerable surplus of earnings is a requisite for the sale of common stock and the maintenance of the credit of the corporation. To ignore these conditions of the capital market would be little less than financial suicide. The progress of utilities in the future depends largely upon the willingness of regulation to meet competitive costs in the modern capital market.

141. Fluctuating Prices and the Earnings of Capital *

The rate necessary under regulation to attract private capital into public service industries must give the investor a proportionately larger return in periods of continued rising prices than at other times—at least as much more as the market itself does in fixing the rate of new loans.

The need for regulatory bodies to regard this fact in setting up ''an independent standard of fairness to investors similar to the conception of a fair standard of living for wage-earners'' is urged by J. Maurice Clark. ''That standard demands,'' he

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* Adapted from J. Maurice Clark, "Some Neglected Phases of Rate Regulation," *American Economic Review,* IV (1914), 565-574.

says, "that in an era when prices have long been rising at an average rate of over 3 per cent a year, investors should receive 3 per cent more than in an era of steady prices, and 6 per cent more than they should be allowed if prices were falling at the same rate."

The adjustment of the rate of return to the price-level might conceivably be accomplished, he says, by adding or subtracting automatically each decade the full amount of the average annual change in the index number of prices for that decade; or, a tabular standard might be used to calculate both payments of interest and repayments of principal. But this is hardly useful in rate regulation unless applied also as the method of handling bonds, not only in quasi-public industries but in others as well.

"What we may perhaps expect . . . is that as business men take a more and more intelligent interest in general statistics of business conditions, they will apply their knowledge of price changes to their individual borrowings and especially to their calculations of their own true profits and losses, on which their demand for loans must be based; and that as a result the market rate of interest will compensate much more closely than in the past for the ups and downs of prices. If this occurs, it will become a fact which the officials charged with regulative rates can no longer by any possibility ignore."

He points out the error of short-term financing when the stringency is really due to the shrinkage of the dollar. He analyzes the relation between the price-level and reinvested earnings as a basis for determining the rate of return, and concludes:

"First, if the depreciation of gold continues, it will probably call for higher rates of income on investments including those in quasi-public industry, than the returns to which we have become accustomed. But if prices are to fall steadily from now on, all industries may be able to borrow more cheaply than at present, and the 'reasonable return' in public service industries may be lower than at present.

"Second, if betterments made out of earnings are entitled to future dividends at the current rate, the amount of such betterments should be counted exactly as if they were cash dividends for purposes of regulation of charges, but if this is done, it will be public policy to allow a higher total return than that which we are accustomed to consider reasonable.

"Third, if earnings are to be allowed on such betterments, it becomes advisable to see to it, that they are expended with reasonable economy and for purposes whose public importance justifies the outlay, with at least as much care as we spend in safeguarding the expenditure of funds raised by the issue of new securities.''

142. Fixed Rate of Return *

Effective regulation of public utilities requires that the rate of return shall be as definitely fixed and controlled by exact accounting as is the rate-base. ''Fair value'' for rate-making is the ''net cost of the properties''—because cost is the sole ''value'' which does not alter and is easily controlled. Likewise, in the rate of return, there is distinct cost—namely, the amount demanded by investors at any one time to provide funds.

This is the view held by John Bauer in his analysis of the rate of return. He advocates a single uniform rate fixed once for all upon the existing investment, determined by the initial valuation; and a rate upon future additional investment, determined by the market conditions at the time. He would apply such a reasonable uniform percentage to all of the companies, and thus do away with the arbitrary and unimportant distinctions which complicate the rate decision. ''But,'' he adds, ''if differences must be recognized between individual companies, as may prove to be necessary in the face of widely different conditions, there should be a single determination for each company so that no further variation would arise in the future. If, for a given property, it would appear that a 6 per cent return on the total net investment determined in the valuation is reasonable, this should continue permanently as the rate of return on the existing investment. We should then have a definite rate upon a definite sum established by appraisal, so that the amount of the return included in the cost of operation would not be subject to further variation, uncertainty and dispute. The rights of the companies and the obligations of the consumers would be fixed.''

Seven per cent, he thinks, represents a fair return on net investment, although the rate for bonds may be lower and the return on capital stock higher.

''Suppose we appraise the property of a company whose se-

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* Adapted from John Bauer, "Reproduction Cost and Desirable Public Utility Regulation," *Journal of Land and Public Utility Economics*, II (1926), 408-426; and *Effective Regulation of Public Utilities* (New York: Macmillan Company, 1925), Chap. X, pp. 253-274.

curities consist of equal amounts in bonds and stocks. Then a reasonable assumption would be that the bonds were issued on a 6 per cent basis and the stock to bring a return of 8 per cent. A 7 per cent allowance on all of the property would provide for the 6 per cent interest and 8 per cent dividend, and both classes of security would be treated in accordance with the fair expectation of the investors.

''But assume that the investment is divided into 75 per cent bonds and only 25 per cent capital stock, then both the required interest on the bonds and the expected return on the stock would be higher, and in the aggregate the 7 per cent on the total investment would still be reasonable.''

The rate of return of future capital requirements will be fixed by the market, ''but, let it be equally clear that this does not require, at any point, a readjustment of return on past investments.

''At any point, the rate of return on new investment is a fixed element in the market that cannot be avoided, and it remains fixed for the lifetime of the security. But it applies strictly only to the particular transaction and does not alter the equally fixed rates placed upon all the successive investments. At every point the particular conditions control and the investors will provide the necessary funds, if they have the assurance, through the rate-making machinery, that they will actually receive the return agreed upon.''

He recognizes that, to the extent bonds are employed in public utility financing, the rate of return is already definitely fixed by the indenture at the time of issue for the lifetime of the bond. But he would apply the fixed return equally to those bond issues which are authorized under a single mortgage but issued only as the funds are needed and at varying rates depending upon the market at time of actual issue. ''At every point, each bond will represent a definite contract of the same terms as all the bonds provided under the mortgage. In every instance, the liability of the corporation, both as to annual interest payments and final principal, is fixed by contract . . . without any adjustment for subsequent change in the purchasing power of money or shift in the market rate of interest.''

The difference between the contract rate of interest and the market at any one time is adjusted, he points out, by the premium or discount. As to preferred stocks, the rate of return is fixed, even as with bonds, except that it does not constitute an absolute obligation if earnings are insufficient. Likewise, the contract and the market rates are equalized by premium or discount, but the amounts of such are not amortized, since there is no date of maturity for the stock.

The real force of his argument is the effect upon common stock which, for the purpose of such automatic accounting control, would be transformed virtually into preferred stock with specified dividend rate. This could be accomplished simply by order of the commission fixing a rate of return upon par. Such means would avoid the necessity of legislative action, first, to do away with common stock in utilities; and second, to permit issue below par.

''The inherited practice of common stock unlimited as to dividend rate but with the prevention of issue below par has outworn its usefulness and should be adjusted to the conditions of the regulated enterprises. . . . Our idea of common stock harks back to unregulated and speculative business and does not square with the underlying notions of regulation. . . . Common stock is viewed generally as a risk-bearer, protecting bondholders and preferred stockholders from the fluctuations and hazards of the business. . . . In the regulated enterprises, the risk element or speculative factor has been largely eliminated, and all security owners are in reality treated as public creditors. All are entitled to a fair return, and within the limits of what the traffic will bear are practically guaranteed the return.''

143. The Control of Return on Public Utility Investments *

Professor Bauer seems to maintain the thesis that control of return on investment should be the chief aim of legislators and commissioners rather than the fixing of so-called ''reasonable'' rates. This main proposition depends upon the following premises:

1. It is not only desirable but also generally possible to establish a simple and uniform basis of valuation.

2. A uniform, ''definite rate of return and no more'' should be allowed upon the investment as determined by this valuation; and the investors are neither entitled to, nor in reality expect, greater returns.

. . . It is true of many, perhaps of most, public utilities, that

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* Excerpts from Edmond E. Lincoln, "Bases of Valuation in the Control of Return on Public Utility Investments," *American Economic Review*, VI (1916), p. 568.

the business is likely to be carried on for some years at an abnormally small profit or even at a considerable loss. Under such circumstances, even though we may favor the strict regulation of profits, justice to all certainly demands that an addition to the valuation be made, proportionate to the difference between the ''reasonable'' return to be allowed in the future and the actual return received in the past. In lieu of this arrangement, the only other course to follow would be to allow a higher rate of profit than the usual rate, until stockholders should be recouped for former losses. . . .

. . . All the capital that assists in the production of a utility should be awarded its full share of the profits. . . . The writer feels that Professor Bauer has, to some extent, overlooked the psychology of the investor—who is, in the beginning, often something of a speculator—in his repeated assertions that all *that* individual expects is a ''fair'' return upon his original investment plus reinvested earnings. . . . The original investor in public utilities has frequently assumed heavy risks, for which he is entitled to more than a mere ''fair'' return—whatever that may be. . . .

Any real enhancement of value of the property, from whatsoever cause, should, from the investor's point of view, rightfully increase profits. *Sacrifice at the time of investment must not be confused with present sacrifice.* . . . Professor Bauer appears to approach dangerously near to circular reasoning when he insists upon a ''clear single basis of valuation'' and ''a definite rate of return allowed on this amount and no more'' —*all in the interests of ''the common good.''* The vastly significant question of the regulation of profits *versus* the fixing of rates is raised. To be sure, these two things may be different aspects of the same problem. Yet, whenever the first aim of legislators becomes the rigorous regulation of profits, the most important stimulus to individual initiative is taken away. Allowance for past losses in the case of a concern which has had time to ''get on its feet'' is indefensible; but *the failure to allow a premium for efficiency would be exceedingly disastrous.* The inducement of *probable* high returns has frequently been necessary in order to secure the capital needed to develop the country. The stimulus of *possible* high profits now and in the future is at the very basis of that enterprise which ultimately reduces the cost of service and leads to the advancement of society in general. Let the dead level of uniformity of profits be introduced, and a premium will be put upon inefficiency; ability will be penalized; capital will seek more profitable fields; service will become inadequate; and prices will tend to remain far higher than they would have been without such "over-regulation." . . . Carried to its logical conclusion, this method of control of the return on public utility investments can lead in only one direction—to the "*Socialistic State.*"

144. Rate of Return Necessary to Maintain Stock at Par *

If income were limited to a constant return on original cost, the market, or exchange, value of a utility property during a high-price period would be less than during a period of low prices. The market value being lower, interest rates on borrowed funds would be higher in relation to former rates, as well as to the prevailing level of interest. In fact, while per cent earnings would remain constant absolutely, they would decline relatively because of the general rise in commodity prices and interest. Additional funds for expansion and improvement would not be forthcoming except at prohibitive cost. All forces would conspire to the embarrassment of the utility, to the impairment of service, and to the inconvenience and discomfort of the public.

It does not follow, however, that a fixed rate of return is a concomitant of prudent investment (adjusted original cost) as a rate base any more than it is of the current methods of value finding. Some commissions apparently have adopted a uniform rate of return for all utilities at all times irrespective of circumstances. Others vary the return to meet conditions affecting the individual company. The latter is sanctioned by judicial opinion and should be the practice of all commissions. In Willcox *v.* Consolidated Gas Company [1] the Supreme Court said, in defining the rate of return:

> There is no particular rate of compensation which must, in all cases and in all parts of the country, be regarded as sufficient for capital invested in business enterprises. Such compensation must depend greatly upon circumstances and locality; among other things, the amount of risk in the business is a most important factor, as well as the locality where the business is conducted, and the rate expected usually realized there upon investments of a somewhat similar nature with regard to the risk attending them.

At the present time, the utility is allowed to charge a rate sufficient to meet operating expenses, including taxes and depreciation, and to yield a reasonable return on the fair value of the property used and useful in the public service. It is out of the reasonable return that interest charges and dividends on stock must be paid. There is no guaranty, however, that the utility will be given earnings sufficient to meet interest obligations and stock dividends. The adequacy of the return is measured by reference to two factors; first, the fair value of the property; and, second, a rate on this value which, in the particular locality and at a given time, would attract capital, having due regard for the reasonableness of the capitalization. If the utility is capitalized far in excess of the fair value of the property, there cannot be exacted from the patron a return sufficient to bear the charges on the inflated securities. The overcapitalized enterprise is obliged to pay a higher price for capital than one with a capitalization properly distributed between funded debt and capital stock and supported by assets. It is self-evident that, if overcapitalization obtains, the equity of a rate cannot be decided by what the particular utility would have to pay for money, but rather by what would be paid if the securities were well-balanced and in no sense fictitious. This principle has been discussed thoroughly in Smyth *v.* Ames.

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* Excerpt from John H. Bickley, "Public Utility Valuation for Rate Purposes," *American Economic Review*, XVI (1926), 30-33.

[1] 212 U.S. 19.

According to the methods proposed by Mr. Justice Brandeis, the rate of return would be measured by the capital costs of the enterprise. ‘‘Capital charges cover the allowance, by way of interest, for the use of capital, whatever the nature of the securities issued therefor; the allowance for risk incurred; and enough more to attract capital.’’ (Southwestern Bell Telephone Company.) This contemplates a return varying with interest. By this plan, a fair return is finally reduced to an adequate compensation for capital raised by stock issues. This can be explained by example. Let it be assumed that a public utility property was constructed in 1913 at a cost of $1,000,000 prudently invested; and that this sum was financed by an issue of $750,000 of 5 per cent bonds and $250,000 of stock; and that both issues were sold at par on the basis of prospective earnings equal to approximately one and three-fourths times the bond-interest cost. It may be assumed, further, that during the first year of operations the utility earned $67,500 after meeting operating expenses, including taxes and depreciation. The bond interest would have absorbed $37,000; and after the payment of a dividend of 6 per cent on stock, there would have been a balance of $15,000 for appropriation to surplus. Placing bond interest in the same category with operating expenses and measuring the return by reference to capital stock, it is found that the utility earned 12 per cent.

The next step in the application of the principle is to determine what a reasonable return would have been in 1919, if the prudent investment had remained unchanged. It is a well-known fact that commodity prices and interest were higher in 1919 than during the years immediately preceding the war, and for this reason the allowed return should have been more. In measuring the 1919 return, it may be assumed that the bond-interest cost was still $37,500. This is a fixed charge, which, in the absence of new financing, does not vary.

There remains only one question to be decided: What must be earned on the stock in order to make it an attractive investment and to enable the company to obtain additional capital if the need were to arise? This question can be answered with a fair degree of accuracy by an observation of certain facts, among which may be mentioned the following: (1) the amount earned on the stock; (2) the market value of the stock and the quantities sold at this price; and (3) the price paid for capital by similar enterprises. These and other factors would indicate reasonable and necessary earnings on the stock. The problem may be viewed, also, from the angle of what the utility would have to earn in order to keep its stock at par. This can be measured as suggested above. To hold the stock at par and attract capital, it is essential not only that the utility pay dividends commensurate with the risk and the general level of dividends in relation thereto, but also that there be a margin of income to provide for future needs and contingencies. It has been assumed that in 1913 a necessary and reasonable return on the stock would have been 12 per cent. An equivalent return in 1919 might have been 16 per cent. After paying an additional 2 per cent dividend, a total of 8 per cent, or $20,000, the balance available for surplus would have been $20,000. With such results, the stockholders would have benefited by a higher percentage return in dividends, and the larger addition to surplus than during the 12 per cent year would have tended to hold the stock at par and perhaps would have raised the market value above this price. How, then, could it be objected that there would be a confiscation of property or the stockholders' values?

A return of 16 per cent, or $40,000, on the capital stock would have represented earnings of over two times the bond interest: that is, the income available for interest would have been $37,500, the amount paid on bonds, plus the $40,000 earned on stock, a total of $77,500. This amount would have been equal to 7¾ per cent on the prudent investment, as contrasted with 6¾ during 1913. Thus, the salutary effects enjoyed by the stockholders would have been shared by the bondholders. In the example, the return to the bondholder was fixed at 5 per cent; and, in the absence of an increase in profits, a rise in the general level of interest rates would have been accompanied by a decline in the market value of the bonds to a point that would have yielded the prevailing rate of interest for the given security. But this decline would have been abated, if not wholly prevented, by the rise in earnings and income security from one and three-fourths times the bond interest to more than two times the interest. In other words, the added income security for the bondholders would have tended to hold the bonds at par, and the bondholders would have thereby shared the benefits of the higher return.

It could not be expected, however, that the bonds could always be maintained at their par value, but the tendency would be in this direction. The actual result would be determined by the rate at which the bonds were issued, the prevailing level of interest at the time of the inquiry and the quantity of income and property security. If, as in the case of railroad bonds issued years ago, the securities had been sold on a 3 per cent basis, the utility could not be allowed to earn an amount today which would keep these bonds at par. This would be an impossibility under any system of rate regulation.

145. Determining the Rate of Return Under a Cost-of-Service Franchise *

Section 10. *Rate of Return.* For the twelve months period commencing July 1, 1925, and ending June 30, 1926, the company shall be entitled to a return at the annual rate of 7.7 per cent upon the value of its investment hereunder, which rate is based upon the recognition of the allowances, heretofore fixed by the Railroad Commission, of 7.5 per cent annually upon the railroad property and of 8.0 per cent annually upon the electric and heating utility property.

For each quarter-year commencing on the first day of July or October, 1926, or on the first day of January, April, July or October of any year subsequent to 1926 during the period of operation under this contract, if the index interest rate (computed as in this section 10 hereinbelow provided) for the preceding quarter-year, shall be 5.7 per cent, the normal annual rate of return to be allowed the company hereunder shall be 7.7 per cent. For each such quarter-year, if such index interest rate, for the preceding quarter-year, shall be greater than 5.7 per cent, then the normal annual rate of return to be allowed the Company hereunder shall be greater than 7.7 per cent, or if such index interest rate shall be less than 5.7 per cent, then such normal annual rate of return shall be less than 7.7 per cent, by a sum in either case equal in amount to one-half the amount by which such index interest rate is greater or less, as the case may be, than 5.7 per cent.

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* From *An Ordinance constituting a contract between The City of Milwaukee and The Milwaukee Electric Railway and Light Company*, passed by the Common Council March 2, 1925. This franchise was defeated when submitted to referendum vote.

The stipulated return for any such quarter-year to be allowed the Company upon the value of its investment hereunder, as a component of the cost of the service as aforesaid, shall consist of the gross return calculated at the then current normal annual rate of return computed as aforesaid, diminished by a sum equal in amount to one-half the then current normal differential rate (computed as in this Section 10 hereinbelow provided) applied to the aggregate principal amount of the bonds of the Company, if any (not, however, exceeding in amount twice the credit balance, if any, at that time standing in the City Equity Account), secured by the Municipal Mortgage as in Section 22 hereinbelow authorized and on the first day of such quarter-year outstanding in the hands of the City; provided, however, that the gross return calculated as aforesaid shall for no such quarter-year be diminished pursuant to the foregoing provisions of this paragraph, to an amount which shall be less than an amount sufficient to enable the Company to pay dividends out of its current earnings for such quarter-year upon such proportion of the Company's entire common stock then issued and outstanding as the value of the Company's fixed property within the Metropolitan District, determined as in Section 5 hereinabove provided, then bears to the aggregate value of the Company's fixed property within and (as may be determined by the Railroad Commission) outside of the Metropolitan District, at an annual rate equal to the rate of interest which the credit balance in the City Equity Account then bears.

Provided also, in case such index interest rate of the Company computed for any quarter-year shall be at a figure in excess of

6.3, then, and in every such case, the formula for computing the rate of return for the next succeeding quarter-year, as in this Section 10 prescribed, shall not be employed, but the contracting parties shall forthwith negotiate and agree upon the rate of return to be allowed the Company for such quarter-year upon the investment hereunder, and in the absence of agreement upon such new rate of return within fifteen days after the first day of such quarter-year, the matter shall be submitted to the Railroad Commission for determination and both contracting parties shall be bound by the determination of said Commission.

The index interest rate, for any quarter-year, shall be computed as an average (weighed as to the principal amounts of indebtedness to which the several annual interest rates are applicable and as to the periods of duration of such amounts during the quarter-year) of the several annual interest rates applicable to (a) the several parts of the indebtedness of the Company outstanding at any time during the quarter-year which shall be payable not less than one year from the respective dates on which the several parts thereof shall have been incurred, except those portions, if any, of such indebtedness which at that time shall be secured by the Municipal Mortgage and/or shall be represented by the credit balance in the City Equity Account hereinbelow authorized, (b) the several parts of the indebtedness of the Company outstanding at any time during the quarter-year, which shall be owing to any banker, bank, trust company, corporate fiscal agent and/or moneyed institution and (c) all other indebtedness of the Company outstanding at any time during the quarter-year, if any, which shall have been incurred by borrowing money, with the exception of Municipal Mortgage indebtedness and City Equity indebtedness as aforesaid. In the calculation of said index interest rate, there shall be included the respective specified nominal annual rates of interest, the quarter yearly cost of amortizing over the respective periods of the several items of indebtedness all bond and note discount and all expenses of issuance incurred, including therein all discount and expense theretofore remaining unamortized as a result of refunding operations, the cost incurred by the Company during the quarter-year in connection with the administration of the respective trust estates established for the security of the several items of indebtedness, together with all expenses incurred by the Company during the quarter-year, pursuant to the requirements of any contract with reference to any such items of indebtedness, in paying and/or reimbursing taxes imposed upon the holders of any securities representing any such items of indebtedness.

The normal differential rate applicable as of any time shall be computed by subtracting the then current index interest rate from the then current annual rate of return.

The Company covenants that, throughout the period of operation under this Contract, the proportion of the Company's share capital (as in this Section 10 hereinbelow defined) to the Company's debt capital (as in this Section 10 hereinbelow defined) shall be at all times maintained at a ratio of not less than three to seven; provided, however, in the event that the Company at any time shall violate this covenant by issuing securities and/or incurring indebtedness in excess of the amount to be determined by applying such proportion, then, and in every such event, nothing in this Section 10 shall be construed in any way to impair or affect either the validity of such securities and/or indebtedness in accordance with the terms thereof or the obligation of the Company thereunder; provided further that nothing in the foregoing proviso shall relieve the Company from the imposition of any penalty to which it would otherwise be subject in accordance with the provisions of Section 21 hereinbelow.

For the purpose of this Contract, "share capital" is hereby defined to comprise (a) the aggregate par value of all the capital stock of the Company, currently issued and outstanding, (b) the amount of the current corporate surplus, surplus reserves and undivided profits of the Company, together with (c) the current credit balance in the City Equity Account. "Debt capital" is likewise hereby defined to comprise the aggregate amount of all those classes of indebtedness of the Company in this Section 10 specified for use in determining the index interest rate, together with all that indebtedness of the Company, if any, currently secured by the Municipal Mortgage.

In calculating at any time, in accordance with the provisions of this Section 10, the index interest rate, the several classes of indebtedness of the Company, the amounts of the share capital and debt capital, respectively, of the Company, and the amount of the common stock of the Company at any time issued and outstanding, the figures set forth in the then current corporate balance sheet of the Company shall govern. Such corporate balance sheet as of any given date shall be computed by making additions and subtractions, representing actual changes in the property or obligations of the Company, to or from the corporate balance sheet of the Company, as of December 31, 1924, a copy of which is hereto attached, marked "Annex B." Provided, however, that the value of the Company's investment hereunder to which such rates of return shall be applicable for the purpose of computing the stipulated return to which the Company shall at any time be entitled shall be determined as in Section 5 hereinabove provided, without resort to said corporate balance sheet of the Company except as in said Section 5 expressly provided.

146. Fair Return a Function of the Borrowing Rate *

When one loans money on about the best security that any one knows of, namely, on an Iowa farm mortgage, he intends to loan not more than half of the value of the property mortgaged. When one loans money to an industrial enterprise, he proceeds on much the same basis. Looking first to the earnings, he lends only so much as shall require an interest payment equivalent to half the reasonably certain net earnings of the enterprise. As in the case of the farm mortgage, the lender requires a value to be shown by earnings capitalized at his demanded interest rate equivalent to twice the sum that he is willing to lend.

Money lent to industrial enterprises is less well secured than is that lent on farm mortgages, and hence, although a value of twice the mortgage loan may be ordinary and ample security for a farm loan, twice the value of a mortgage loan in the case of an industrial enterprise is about the irreducible minimum because of the greater risk of the money invested in an industrial enterprise. Usually, somewhat more than a reasonably certain earning capacity of twice the interest charge must be shown, to secure loans at the ordinary market rate for money. Money can be borrowed sometimes by old, strong, thoroughly established properties when the net earnings are as little as one and one-half times the fixed charges.

The investor who loans to an industrial enterprise by the purchase of stock runs greater risk of loss than he who loans on a mortgage, that is to say, than he who buys the bonds of the enterprise; and it would seem to be reasonable to conclude that he who invests his money in the stock of the enterprise should expect a reasonably certain net earning capacity to be shown, over and above the payment of operating expense and the fixed charges, of at least twice the lending rate on the money that

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* Excerpt William G. Raymond, *The Public and Its Utilities* (New York: John Wiley & Sons, 1925), Chap. XXIV, pp. 281-290.

he invests, and almost as reasonable to conclude that a prospect of three or more times the lending rate on the money which he invests is necessary to induce the investment.

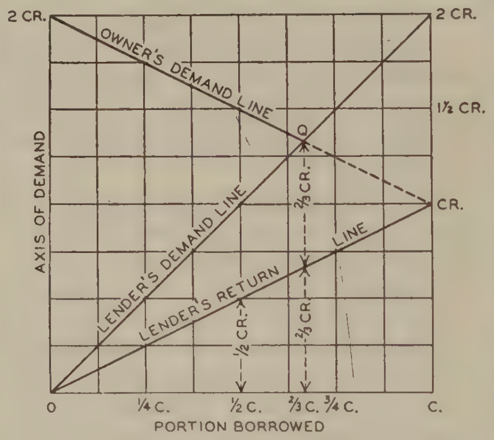
Money invested in a public utility is supposed to be somewhat less hazardously invested than that invested in other enterprises, which are entirely independent, and free from control. In theory probably this is true, albeit in practice it often proves to be untrue. The public, in spite of its ofttimes carelessly and sometimes wilfully unfair demands on its utilities, believes that because of their monopolistic or somewhat monopolistic character they are less risky enterprises than other independent, uncontrolled undertakings, and hence should demand a less rate of return on the investment. Probably it would be quite difficult to disabuse the public mind of this attitude, because theoretically the attitude is right and practically it would be right if the public were always fair.

Based on these suggestions that the lender to industrial enterprises expects, as a rule, a reasonably certain net earning capacity of not less than twice the interest charge on the total indebtedness, and usually expects more than this; that the other investor must expect not less than the lender and probably should expect more after paying the lender his interest; and that a public utility investment should be somewhat more secure, even though it is not always so, than an independent, uncontrolled enterprise; an attempt will be made to develop the relation that exists between the rate that must be paid for money borrowed by a successful utility, and the fair return rate for that utility.

To Find the Fair Return Rate in Terms of the Borrowing Rate. Let it be assumed that the lender to a utility owner requires a minimum net earning capacity of twice the fixed charge, and that the owner investor is entitled to this same minimum on the sum that he invests, and let C represent the total capital investment in an enterprise and R the lender's normal rate of interest. If none of the money is borrowed, the earnings to satisfy the lender investor should be nothing, but to satisfy the owner they must be $2 \times CR$. If all of the capital is borrowed, the annual net earnings to satisfy the lender will be $2 \times CR$.

Then, referring to Chart 61, if axes of "portion borrowed" and "demand" are drawn, and a line is drawn from the intersection of the axes to a point $2 \times CR$ above C on the axis of "portion borrowed," an ordinate to this line from any point on the axis of "portion borrowed,"—as ½ C—will be to scale the net annual earning demanded by the lender. So far as the lender is concerned, these ordinates measure the total required net annual earnings. The line drawn is called the lender's demand line. A line drawn from the intersection of the axes to a point CR above C on the axis of portion borrowed may be called the lender's return line since ordinates to this line measure the annual interest payments to the lender—the fixed charges.

Chart 61



RELATION BETWEEN FAIR RETURN AND PORTION OF CAPITAL BORROWED. REQUIRED EARNING CAPACITY TWICE THE FIXED INTEREST CHARGE REQUIRED BY THE LENDER.

If the matter is considered from the standpoint of the owner's demand for return and risk, an ordinate of 2 × CR erected at the intersection of the axes will measure the demand when nothing is borrowed, and since the owner has nothing invested when all the capital is borrowed, his demand for this condition is only the fixed charge. He would expect something more as pay for his service, but the amount cannot be determined and any return would be at an infinite rate on his investment, which, being nothing, is entitled for itself to nothing. Hence if a line be drawn from the point 2 × CR above the intersection toward the point

CR above *C*, until it intersects the lender's demand line at *Q*, the ordinates to this line will measure the owner's total demand on account of return and risk. The portion of these ordinates below the lender's return line measure the fixed charges, and the portion between the lender's return line and the line last drawn, called the owner's demand line, will measure the earnings on account of return and risk demanded by the owner on account of his own investment.

Up to the point of intersection *Q*, it is the owner's demand that determines total required earnings on account of return and risk. Beyond *Q*, it is the lender's demand that determines these earnings, since the owner's demand is less than the lender's demand when the portion of capital borrowed is more than that shown directly below *Q* on the axis of portion borrowed. Beyond this point the owner will receive more than his demand.

It can be shown by measurement on the diagram and by mathematical analysis, that, under the conditions assumed, the point *Q* is directly over the point $\frac{2}{3}$ *C* on the axis of portion borrowed. The conditions assumed are:

1. The lender demands total net earnings equivalent to at least twice his interest charge.

2. The owner demands total net earnings of at least twice the lender's rate on the money invested by himself.

3. "Net earnings" means, to the lender, earnings over and above operating expenses; and to the owner, earnings over and above operating expenses and fixed charges.

The diagram shows that, under the conditions assumed, when less or more than two-thirds of the capital is borrowed the total earnings on account of return and risk must be greater than when just two-thirds of the capital is borrowed; the owner's demand determining these earnings when less than two-thirds is borrowed and the lender's demand determining them when more than two-thirds is borrowed.

Stated in another way, the total fair earnings on account of return and risk are a minimum when two-thirds of the invested capital is borrowed. At this minimum point the total fair earnings on account of return and risk are $\frac{4}{3}$ *CR* or one and one-third times the lender's interest rate on the whole investment. Of this sum, $\frac{2}{3}$ *CR* goes to the lender and $\frac{2}{3}$ *CR* to the owner. The lender receives his regular rate of *R* per cent on his loan, and is secured by net earnings equivalent to twice this sum. The owner receives twice the lender's rate on his own contribution to the investment, and this covers fair return on a safe investment and payment for his risk.

Fair Return Rate is from Four-thirds to Three-halves of the Borrowing Rate. From the standpoint of a public, controlling utility enterprise and wishing to be fair, it seems to be desirable that just two-thirds of the capital invested in these enterprises shall be borrowed, because with this proportion borrowed the net earnings required for interest and fair dividends are a minimum. Indeed, it may be reasoned that in determining a fair return rate it should be assumed that the utility has adopted this borrowing limit; that if it has borrowed less it should be satisfied with a less return, and that if it has been able to borrow more it is entitled to the extra return resulting.

If this assumption is made, then under the conditions of this demonstration the fair rate of return on the total investment should be one and one-third times the going rate of interest, including the effect of discount, paid by utilities of the kind under consideration at a particular time. Thus, if 6 per cent is the going lender's rate, 8 per cent would be the fair rate of return on the investment. This would pay the lender 6 per cent on his contribution to the capital, and give him ample security, and would pay the owner 12 per cent for his fair return and risk. It is believed that such returns will attract capital to utility investment, and that less than such returns will be not attractive.

As possible allowable variations from the financing plan most favorable to the public, it may be assumed that as little as one-half of the investment is borrowed or as much as three-fourths of the investment is borrowed.

Referring to the figure or to a computation, it will be found that if one-half the investment is borrowed, the total earnings on account of return and risk are $1\frac{1}{2}$ CR. The lender receives R per cent on his contribution, and the owner 2 R per cent on his contribution as before. If, however, one-half of the capital has been borrowed and the enterprise is allowed earnings on account of return and risk of only one and one-third times the lender's rate, then the owner will receive not 2 R per cent on his contribution, but $1\frac{2}{3}$ R per cent.

If three-fourths of the capital is borrowed it is found, by reference to the figure or to a computation, that one and one-half times CR is required on account of return and risk, just as when one-half of the capital is borrowed. As in that case, too, the lender will receive R per cent on his contribution, but the owner will receive 3 *R* per cent on his contribution. If, however, the regulating body limits earnings to those suitable when two-thirds of the capital is borrowed, the owner will receive 2⅓ *R* per cent.

It is suggested that this discussion includes the limitations of proper public utility earnings under that conception of public control which demands that the earning rate shall be limited to a fair rate of return on the fair value of the property used in the service of the public. To be sure, nothing has been said about value; only investment has been considered. But it is thought that a method has been developed for finding the fair rate of return on investment, that rate which is the least that will attract capital freely to the enterprise, and it is believed that this rate on investment will result in a fair rate of return on value. If the property is successful on this basis, its stock will sell on the market on an *R* per cent basis and the corresponding value of the property will be one and one-third times the investment.

The discussion would seem to result in the conclusion that the fair rate of return on investment in utility properties, properly regulated, is from one and one-third times the going rate for money loaned to such utilities with proper security, to one and one-half times that rate, the lower rate applying to large, old, seasoned, substantial enterprises, in the older communities, with accumulated and maintained emergency surpluses, and the higher rate applying to smaller, newer, less well seasoned enterprises, in new or old communities.

The lower rate is thought to be the minimum fair return that a court should judge to be non-confiscatory. It is recognized that it will never be possible to establish service rates that will yield just the proper fair rate of return. The rate of return under any system of service rates will not be uniform from month to month or year to year. If the return is continuously above the higher limit found by the method given, lower rates for service should be established; if the return should be found to be continuously much below the lower limit, higher service rates should be established by a regulating body trying to be fair. Neither is it likely that just two-thirds of the investment will be borrowed. It is believed that the theory developed is sound and that practice will be the more reasonable the more nearly it conforms to the theory.

It would appear to be wise to limit borrowing by railroads to, say, one-half the total investment, and to permit correspondingly higher returns, that is to say, three-halves of the borrowing rate. The reason for this is that railroads, like many private industries, feel the variation in business conditions much more than do gas, or electricity, or water-supply enterprises. The uncontrollable variation in volume of business is likely to be great, and because of this there should be generous returns in times of prosperity and relatively small fixed charges to consume net earnings in times of depression. To control this matter, it is not enough to provide, as do some states, that the bonded debt shall not exceed the par value of the capital stock, or twice that value; it is necessary rather to provide that the respective contributions to the real capital investment shall be within the prescribed limits. Exact relationship cannot be specified but limitations may be set.

Profit and Return. Two bases have been suggested for determining the reasonable net return to a utility company for the service that it renders. In Chapter XX (*i.e.* on control of rates, pp. 221-2 *infra*) it was suggested that the proper earning should be the cost of the service, including a going interest charge on the entire investment plus a reasonable profit on the total cost, the return to the company being the interest time and the profit item, out of which the company must pay whatever fixed charges it may have. In the foregoing paragraphs of the present chapter it has been suggested that the proper rate of return on the investment, not the value, is from one and one-third to one and one-half times the going rate of interest on successful utility properties of the general class of any one under consideration.

These two suggestions ought to mean the same thing, and they ought also to mean the court's minimum fair return on the fair value of the property.

The going rate of interest on loans to successful enterprises of a given class is determinable at any time with a reasonable degree of precision. The value of the property is largely a matter of judgment, and the profit rate that may be allowed on the cost of service is to some extent a matter of judgment, but both of these may be determined within reasonable limits by the equations developed in the following discussion.

If C be the total investment; R the going rate for money; O the operating expense including depreciation allowance; and P the profit rate, then if the fair return rate on the investment be assumed to be one and one-half times the going rate for money:

$$\begin{aligned} \tfrac{3}{2}RC &= (0 + RC)\ P + RC \\ \tfrac{1}{2}RC &= (0 + RC)\ P \\ P &= \frac{RC}{2\,(O + RC)}. \end{aligned} \qquad (1)$$

If the fair rate of return is fixed at four-thirds of the going rate, then the profit rate is

$$P = \frac{CR}{3\,(O + CR)}. \qquad (2)$$

The fair value on which the property is entitled to the court's minimum fair return rate is found by capitalizing the net earnings at the minimum fair return rate.

An illustrative example is as follows:

A small plant represents an investment of $100,000, on which similar successful properties must pay 6 per cent for money borrowed. The plant has operating expense of $20,000 annually. A substitution in equation (1), foregoing, indicates a fair profit rate of about 11½ per cent.

By either suggested method of finding the total net return, that return will be $9000 or $8000, according as one and one-half times the going rate for money, or one and one-third times the going rate for money is used. If a court determines that 7 per cent is the minimum fair rate of return, and in recent months this has been the most commonly used rate, the fair value of the property will be either $128,570 or $114,285, according as one and one-half times the going rate for money or one and one-third times the going rate for money is used.

147. The Rate of Return in Terms of the Borrowing Rate—A Study in the Railway Field *

The rate of return expressed in terms of the cost of capital is one approach to a scientific determination of the return to be allowed regulated industries. Market conditions affect the interest rate; the fluctuations in the interest rate are reflected in the market quotations on securities; and the yield is a function of both.

There is this limiting factor, however, that many of the companies do not have their stock listed on the exchanges. Secondly

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* Adapted from L. D. Jennings.—*The Economic Aspects of the Rate of Return*, Chap. 7. Thesis submitted in partial fulfillment of the requirements for M.B.A. Degree, Northwestern University, School of Commerce, Chicago, 1927.

and more important, yields *per se* do not reflect accurately the cost of capital, since questions of corporation control, managerial efficiency, prospective earnings, and speculative profits affect the market price; and these elements are not easily evaluated when determining the necessary allowances for unsecured capital.[1] Furthermore, regulation should provide some incentive to secure capital at low rates which is impossible when the return is based entirely on the experienced cost of capital.

In order to overcome these objections it has been suggested that the rate on secured capital be taken as a base and a differential added to translate the lower rate into the rate of return. Then, if the differential is properly selected for the changing rate of interest, the company will be allowed a rate of return which varies with the cost of capital in such a fashion that a lower cost reacts favorably both to the owners and to their customers.[2]

Accepting the cost of secured capital as a guide, the problem becomes one of determining the differential which translates this figure into the rate of return under different circumstances and conditions.

For statistical material bearing on this subject, the writer took market quotations (yearly average) on all listed securities (93 per cent of Class I railroads having a continuous dividend record for the period 1916 to 1925 which were not unduly influenced by non-operating revenues or questions of corporate control. On this basis twelve companies with a combined capitalization of over $6,500,000,000 were selected, and the market yields to maturity were determined for these securities.

Table 70 gives the weighted average yields as indicated for the period studied, unadjusted for the governmental guarantee of earnings in effect for the period of federal operations and six months thereafter, or for the recapture provisions in the Transportation Act of 1920, or for surpluses which might affect the market quotations on these securities.[3]

For secured capital (Item 1C) the yield swung between the low of 4.56 per cent and the high of 5.97 per cent. From the low point in 1916 it advanced through 1917, 1918, and 1919 to the high in 1920 and then fell rapidly during 1921 to a plateau of approximately 5.09 per cent for 1922, 1923, and 1924 from which it dropped to 4.85 per cent in 1925. Divided into its elements, bonds (Item 1A) and preferred stocks (Item 1B), the same general trend is observed except that the yield on preferred stocks showed a greater deviation from the average than the yield on bonds.

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[1] This difficulty is clearly present when the stock which has not paid dividends for a considerable period still has a good market price.

[2] Economies in capital costs are shared between the utilities and their customers, the rate of return varying directly but not proportionately with the changing cost of secured capital.

[3] With the possible exception of the recapture provisions in the Transportation Act of 1920 these forces would operate to depress the yield for the period studied. That is, the adjustment would be upward.

Yields on unsecured capital computed on a dividend basis (Item 2A); and yields on all secured and unsecured capital computed first on a dividend basis (Item 3A); and second, on earning basis (Item 3B) indicated a market tendency similar to that for secured capital (Item 1C). The exceptions in 1919 and 1922 (3B) are explainable on the grounds of an inadequate sample.[4]

Unlike the yields on the above bases the rate of earnings on unsecured capital (Item 2B) did not follow the same general trend.[5] With the exception of 1918 when three, and in 1922 when two of the companies experienced low earnings, the yield on this basis deviated very little from the average 10.73 per cent.

Stated in terms of the difference between the yields on the various types of securities these fluctuations become more significant. As between bonds and preferred stocks (Item 1B-1A) the differential in yield (neglecting the exceptional instances) varied from .46 per cent in 1916 to .77 per cent in 1921; while for unsecured capital and the average for all capital on the dividend basis (Item 4A) it increased from 1.05 per cent in 1916 to 2.08 per cent in 1921 and then fell with the interest rate to 1.31 per cent for 1925.[6]

A similar movement was noted in the spread between the average yield for all capital on the dividend basis and that for secured capital (Item 5A). Here the variation without accounting for the cost of financing on limited life issues was between .49 per cent for 1916 and .78 per cent for 1921.

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[4] Only five issues of preferred and twelve of common stock were involved in this study. The poor showing of three of the companies for earnings in 1918 and yield in 1922 (one in 1919) coupled with the fact that the government guarantee of earnings still applied in 1918 and 1919 accounts more specifically for these discrepancies. In this connection, however, it is interesting to note that a study now being carried on by the Institute for Research in Land Economics and Public Utilities indicates changes in pure interest levels similar to those shown by unsecured capital and the average of all capital on a dividend basis.

[5] Since the rate of dividends remained practically constant, the market price of the securities had to be adjusted to show increased returns on a dividend basis, showing that had the dividend rate been adjusted the rate on the earnings basis would vary inversely with the secured rate.

[6] These figures denote absolute differences only. Relatively on the basis of the lower rate the tendency is not so marked, although there is some indication that with an adequate sample, the differential would increase relative to the cost of borrowed capital.

Disregarding the variations explainable on the grounds of an inadequate sample, these figures obtained on an interest or dividend basis indicate that the market demands differentials in yields as between the various types of securities which vary directly with the interest rate.

On an earning basis (Item 4B-5B), however, the phenomena observed on a dividend basis (Item 4A-5A) do not appear to be true, for here the yield differential seemed to vary inversely with the interest rate. As between secured and unsecured capital yields (Item 4B) it fluctuated rather irregularly between 6.69 for 1917 and 4.36 per cent for 1920, but for the average yield on all capital as over and against the yield on secured capital (Item 5B) it showed a decided tendency downward during high interest periods from 2.34 per cent in 1916 to 1.74 per cent in 1920, and then back up to 2.50 per cent for 1925.

It appears, therefore, that while yields (and their differentials for various types of securities) computed on interest and on dividend bases fluctuate with changing market conditions, yields computed on an earning basis remain practically constant. If this is true, then a rate of return which provides a constant yield on common stock, with the company privileged to vary dividends with the changing cost of capital, would be substantially in accord with the market demands. The measure of such a rate with reference to the cost of secured capital is found in a fixed differential[7] established as an average for a period of time. Such a policy would allow for a uniform rate of earnings on common stock, but would not provide an incentive to perfect the capital structure or to secure capital at low rates.[8]

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[7] Or a multiplier if it is found that the variations of the differential are relative as well as absolute.

[8] A fixed differential makes it impossible for the stockholders or managers to gain any material reward by securing a low over-all cost of capital, and may even encourage borrowing which is not justified from an economic point of view. If by trading on a very thin equity the managers increase the borrowing rate, the fixed differential applying over all capital will operate to increase the rate of return to the stockholders.

On the other hand a fixed multiplier causes a relative increase in the spread (1½ × 4% = 6%, spread 2%; 1½ × 6% = 9%, spread 3%) between secured and unsecured capital as the rate on secured capital advances. This definitely encourages uneconomical borrowing, for not only does it have the same inherent defects found in the fixed differential but

Other interesting aspects of the study are to be found in considering the times interest earned (Item 6), the earnings on unsecured capital expressed as times the borrowing rate (Item 7), and the earned rate of return expressed as a multiple of the borrowing rate (Item 8).[9] With a secured capital ratio of 60:40 the record of the companies studied shows that the leaders received protection varying from 2.16 to 2.72 times interest earned (Item 6) with an average protection of 2.39, while risk capital (Item 7) earned from 1.73 to 2.39 times the borrowing rate, averaging 2.09.

Expressing the earned rate of return (Item 3B) as a multiple of the secured capital rate (Item 1C) it is found that this figure (Item 8) decreased from 1.524 in 1916, to 1.291 in 1920, and then increased to 1.515 for 1925, the average for the period being 1.413. Adjusted for the cost of financing which, according to Mr. Dorau's study [10] declined from .52 per cent in 1920 to .24 per cent in 1925, the multiplier becomes 1.188 for 1920 and 1.444 for 1925. The changing cost of financing, therefore, appears to exaggerate the changing spreads and movements in interest rates observed in this study.

Assuming that the period taken and the size of the sample are adequate without adjustments for the governmental guarantee in effect for the period of federal operation and six months thereafter or for the recapture provisions in the Transportation Act

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actually places a premium—the increasing spread—on high rates for secured capital.

This leaves only the differential, which varies inversely with the cost of secured capital, to be considered. Here, due to the fact that as the rate on secured capital increases the differential declines, the owners and operators are continually pressed to keep down the borrowing rate to protect their present rate of earnings or to increase them. If this differential is properly graduated to meet the changes in the secured capital rate, the company is under pressure to get the capital adjustment which results in the lowest over-all cost of capital, since the principle of trading on the equity still operates to encourage borrowing, yet, the saving in capital costs due to the fact that the differential varies inversely but not proportionately to the rate on secured capital *is* shared with the public.

[9] Raymond concludes that if lenders demand earnings equal to twice their interest charge and owners require a yield equal to twice the borrowing rate, the rate of return should be from 4/3 (1.33) to 3/2 (1.5) times the borrowing rate. The smaller figure applies to old and well established companies with a high bond ratio (66⅔ per cent), while the higher rate is necessary for newer ventures with lower bond ratios. See Wm. G. Raymond, *The Public and Its Utilities* (New York: John Wiley & Sons, Inc., 1925), Chap. XXV, p. 285.

[10] H. B. Dorau—"The Cost of Railway Capital Under the Transportation Act of 1920," *Journal of Land Economics and Public Utilities*, III (1927), 12-15. See also excerpt therefrom under section 156, p. 790 of this book.

TABLE

WEIGHTED AVERAGE YIELDS, YIELD DIFFERENCES, AND TIMES

	1916	1917	1918
Yield on			
1. Secured Capital			
A. Bonds	4.40	4.76	5.28
B. Preferred Stock	4.86	5.15	5.85
C. Average Secured Capital [a]	4.56	4.81	5.34
2. Unsecured Capital			
A. Dividend Basis [b]	5.61	6.62	7.19
B. Earnings Basis [c]	10.89	11.50	10.06
3. All Capital—Secured and Unsecured [d]			
A. Dividend Basis	4.95	5.48	6.03
B. Earnings Basis	6.95	7.33	7.12
Difference Between Yield on			
4. All Secured and Unsecured Capital			
A. Dividend Basis (2A–1C)	1.05	1.81	1.85
B. Earnings Basis (2B–1C)	6.33	6.69	4.72
5. Secured, and Secured and Unsecured Capital			
A. Dividend Basis (3A–1C)	.49	.67	.69
B. Earnings Basis (3B–1C)	2.39	2.52	1.78
Miscellaneous Data			
6. Times Interest Earned on Secured Capital [e]	2.72	2.72	2.38
7. Earnings on Unsecured Capital Expressed as Times Secured Rate (2B ÷ 1C)	2.38	2.39	1.88
8. Earned Rate of Return Expressed as a Multiple of the Borrowing Rate (3B ÷ 1C)	1.524	1.523	1.333

[a] All capital which has a contractual relation ahead of the common stock is considered as secured capital and since its return is on the basis of the contract this may be called the borrowing rate.

[b] Expresses rate of dividends actually paid on the market value of the common stock.

[c] Expresses earnings per share on common stock at market price after deduction of all fixed charges. (See Moody's Manual: *Railroads.*)

[d] Expresses on a dividend and earnings basis the weighted average yield on all capital which is usually designated as the ratio of return.

[e] Expresses the number of times the interest requirements on all secured capital was earned by the company.

of 1920 and surplus which might affect market quotations, the writer concludes from this study:[11]

1. That the rate of return should vary with the changing cost of capital.

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[11] It may be that a longer period would reduce the effect of war conditions and disclose more accurately the accumulated results of the corporate surpluses. These conclusions, therefore, are only tentative and await the support of further statistical evidence in the public utility field. (See footnote 3.)

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INTEREST EARNED FOR TWELVE SELECTED RAILWAY COMPANIES

1919	1920	1921	1922	1923	1924	1925	AVERAGE FOR PERIOD
5.33	5.93	5.49	5.05	5.03	5.03	4.81	5.11
6.04	6.40	6.26	5.70	5.55	5.52	5.30	5.67
5.40	5.97	5.57	5.11	5.09	5.07	4.85	5.17
7.06	7.63	7.65	6.48	6.78	6.69	6.16	6.78
10.76	10.33	10.87	9.87	11.14	10.96	11.49	10.73
6.02	6.59	6.35	5.62	5.72	5.68	5.34	5.78
7.42	7.71	7.57	6.80	7.37	7.29	7.35	7.29
1.66	1.76	2.08	1.37	1.69	1.62	1.31	1.62
5.36	4.36	5.30	4.76	6.05	5.89	6.64	5.61
.62	.62	.78	.51	.63	.61	.49	.61
2.02	1.74	2.00	1.69	2.28	2.22	2.50	2.11
2.43	2.19	2.21	2.16	2.35	2.34	2.46	2.39
1.99	1.73	1.95	1.93	2.18	2.16	2.36	2.09
1.374	1.291	1.359	1.333	1.447	1.437	1.515	1.413

2. That a fixed differential or multiplier which maintains a uniform rate of earnings above the cost of borrowed capital will vary the rate of return in conformity with the market demands, but will not provide incentive to perfect the capital structure or to secure capital at low rates.

3. That for old and well-established railroad properties with good financial records, the differential between the rate on borrowed capital (unadjusted for the cost of financing) and the rate of return should be in excess of 2 per cent; or expressed in terms of a multiplier, 1.40 times the borrowing rate.[12]

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[12] These figures are taken as a minimum because the data indicate that the differential increases as the interest rate declines. These measures, however, would be reduced slightly—approximately .25 per cent—if the borrowing rate is adjusted to care for the varying costs of financing.

4. That the 5½ per cent rate of return[13] which Congress has fixed as fair for the railroads is inadequate, for at no time did the market rate for even these select companies reach that low level on an earning basis (Item 3B), while on a dividend basis (Item 3A), if the cost of financing is properly included, 1916 is the only year which would permit the companies to show a surplus.

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[13] See H. B. Dorau, "The Cost of Railway Capital Under the Transportation Act," included in Chapter XIV. (Section 156.) Since this rate is to apply generally to all railway companies and not specifically to any it would appear that the twelve selected companies should show something in excess of such returns, at least on a dividend basis if the more marginal firms are to be kept in business.

148. Chronological Table of Cases Bearing on Rate of Return *

CASE	NATURE OF	PER CENT RATES	REMARKS
Milwaukee Electric R. & Light Co. *v.* Milwaukee, 87 Fed. 577 (1898)	Street Ry.	4½	Confiscatory
Chicago Union Traction Co. *v.* State Board of Equalization, 114 Fed. 557 (1902)	Street Ry.	6	Fair return
Cedar Rapids Water Co. *v.* Cedar Rapids, 118 Iowa 234, 91 N.W. 1081 (1902)	Water	4.4 to 5½	Not confiscatory
Spring Valley Waterworks *v.* San Francisco, 124 Fed. 574 (1902)	Water	5	Minimum rate
Louisville & N. R. Co. *v.* Brown, 123 Fed. 946 (1903)	Railroad	6	Legal rate minimum
Stanislaus County *v.* San Joaquin & Kings River Canal & Irrig. Co., 192 U.S. 201, 48L. ed. 406, 24 Sup. Ct. Rep. 241 (1904)	Irrigation	6	Not confiscatory
Contra Costa Water Co. *v.* Oakland, 165 Fed. 518 (1904)	Water	5	Minimum rate
Cumberland Teleph. & Teleg. Co. *v.* Louisiana R. Commission, 156 Fed. 823 (1907)	Electric	7	Fair return
Pennsylvania R. Co. *v.* Philadelphia, 220 Pa. 100, 68 Atl. 676 (1908)	Railroad	6	Legal rate minimum
Central of Georgia R. Co. *v.* Ala. R. Commission, 161 Fed. 925 (1908)	Railroad	8	Legal rate minimum
Spring Valley Water Co. *v.* San Francisco, 165 Fed. 667 (1908)	Water	5	Reasonable return
Consolidated Gas Co., 157 Fed. 849 (1907)	Gas	6	Fair return
Willcox *v.* Consolidated Gas Co., 212 U.S. 19, 53L ed. 382, 48 L. R. A. (N.S.) 1134, 29 Sup. Ct. Rep. 192, 15 Ann. Cas. 1034 (1909)	Gas	6	Fair return
Knoxville *v.* Knoxville Water Co., 212 U.S. 1, 53 L. ed. 371, 29 Sup. Ct. Rep. 148 (1909)	Water	4	Not decided unfair
St. Louis & S. F. R. Co. *v.* Hadley, 168 Fed. 317 (1909)	Railroad	6	Fair return
Lincoln Gas & E. L. Co. *v.* Lincoln, 182 Fed. 926 (1909)	Gas	6	Minimum return

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* Cases from 1898 to 1923 reprinted from the table prepared in re Pacific Telephone & Telegraph Company as it appeared in *Public Utility Reports* annotated 1924-D 69. Cases from 1923 to 1927 compiled from succeeding volumes of *Public Utility Reports* annotated from cases indexed under Reasonableness of Return—Specific Allowances. (Buffalo, *Public Utility Reports, Inc.*)

148. Chronological Table of Cases Bearing on Rate of Return, Cont'd

CASE	NATURE OF	PER CENT RATES	REMARKS
People ex rel. Jamaica Water Supply Co. *v.* Tax Comrs., 196 N.Y. 39, 89 N.E. 581 (1909)	Water	6	Fair return
Venner Co. *v.* Urbana Waterworks, 174 Fed. 348 (1909)	Water	6	Reasonable return
Owensboro *v.* Cumberland Teleph. & Teleg. Co., 174 Fed. 739 (1909)	Telephone	6	Reasonable return
Cedar Rapids Gas Light Co. *v.* Cedar Rapids, 144 Iowa 426, 138 Am. St. Rep. 299, 120 N.W. 966 (1909)	Gas	5 to 6	Minimum return
Cedar Rapids Gas Light Co. *v.* Cedar Rapids, 223 U.S. 655, 56 L. ed. 594, 32 Sup. Ct. Rep. 389 (1912)	Gas	6	
Shepard *v.* Northern P. R. Co., 184 Fed. 765 (1911)	Railroad	7	Reasonable return
Cumberland Teleph. & Teleg. Co. *v.* Louisville, 187 Fed. 637 (1911)	Telephone	7	Minimum return
Re Arkansas Rate Cases, 187 Fed. 290 (1911)	Railroad	6½	For lean years fair return
Spring Valley Waterworks *v.* San Francisco, 192 Fed. 137 (1911)	Water	3.97	Confiscatory
Des Moines Water Co. *v.* Des Moines, 192 Fed. 193 (1911)	Water	8	Fair return
Louisville *v.* Cumberland Teleph. & Teleg. Co., 225 U.S. 430, 56 L. ed. 1151, 32 Sup. Ct. Rep. 741 (reversing 187 Fed. 290) (1912)	Telephone	5–8	Fair return
Re Alabama Rate Cases, 196 Fed. 800, 197 Fed. 954 (1912)	Railroad	8	Fair return
Re Lincoln Teleph. & Teleg. Co. (Neb.), 19 A. T. & T. Co. Com. L. 134 (1913)	Telephone	7	Not unfair
Buffalo Gas Co. *v.* Buffalo, 3 P.S.C.R. (2nd Dist. N.Y.) 553 (1913)	Gas	6	Fair return
Common Council of Green Bay *v.* Green Bay Water Co., 11 Wis. R.C.R. 236 (1913)	Water	7	Reasonable return
Lincoln Gas & E. L. Co. *v.* Lincoln, 250 U.S. 256, 63 L. ed. 968, 39 Sup. Ct. Rep. 454 (1919)	Gas	7	Reasonable return 6% not confiscatory
Galveston Electric Co. *v.* Galveston, 272 Fed. 147, P.U.R. 1921-D 547 (1921)	Railway	5	Not confiscatory

Galveston Electric Co. *v.* Galveston, 258 U.S. 388, 66 L. ed. 678, P.U.R. 1922-D 159, 42 Sup. Ct. Rep. 351 (1922)	Railway	6.8	Not confiscatory
Pacific Gas & E. Co. *v.* San Francisco, 273 Fed. 937 P.U.R. 1921-D 464 (1921)	Gas	7	Reasonable return
Des Moines Gas Co. *v.* Des Moines, 238 U.S. 153, 59 L. ed. 1244, P.U.R. 1915-D 577, 35 Sup. Ct. Rep. 811 (1915)	Gas	6	Not confiscatory
Willcox *v.* Consolidated Gas Co., 212 U.S. 19, 53 L. ed. 382, 48 L.R.A. (N.S.) 1134, 29 Sup. Ct. Rep. 192, 15 Ann. Cas. 1034 (1909)	Gas	6	Not confiscatory
Brush Electric Co. *v.* Galveston, 262 U.S. 443, 67 L. ed. 1076, P.U.R. 1923-D 573, 43 Sup. Ct. Rep. 606 (1923)	Electric	8	Fair return
Home Teleph. & Teleg. Co. *v.* Public Service Commission, 276 Fed. ——, P.U.R. 1922-B 478 (1922)	Telephone	8	Minimum
Minneapolis *v.* Rand, 285 Fed. 818 (1923) P.U.R. 1924-B 685	Gas	7½	Reasonable return
Bronx Gas & Electric Co. *v.* Pub. Serv. Com. (N.Y. Sup. Ct.) P.U.R. 1923-A 255, 28 N.Y. Off. Dept. R. 329	Gas	8	Minimum
Mo. ex. rel. S.W. Bell Teleph. Co. *v.* Mo. Pub. Serv. Com. (U.S. Sup. Ct.) P.U.R. 1923-C 193, 262 U.S. 276 (1923)	Telephone	5⅓	Inadequate
Georgia R. & Power Co. *v.* R.R. Com. (U.S. Sup. Ct.) P.U.R. 1923-D 1, 262 U.S. 625 (1923)	Gas	7¼	Non-confiscatory, exempt from Federal Income Tax
Bluefield Water Works & Improvement Co. *v.* W. Va. Pub. Serv. Com. (U.S. Sup. Ct.) P.U.R. 1923-D 11, 262 U.S. 679 (1923)	Water	6	Not just compensation
Columbus Gaslight Co. *v.* Pub. Serv. Com. (Ind. Sup. Ct.) P.U.R. 1923-E 602, 140 N.E. 538 (1923)	Gas	6.58	Fair — no proof to contrary
Monroe Gas Light & Fuel Co. *v.* Mich. P. U. Com. (U.S. Dist. Ct.) P.U.R. 1923-E 661 (292F139) (1923)	Gas	5⅙	Confiscatory

148. Chronological Table of Cases Bearing on Rate of Return, Cont'd

CASE	NATURE OF	PER CENT RATES	REMARKS
Mobile Gas Co. *v.* Patterson (U.S. Dist. Ct.) P.U.R. 1924-B 644, 293F208 (1924)	Gas	4.59	Confiscatory
Arkansas Water Co. *v.* Little Rock (U.S. Dist. Ct.) P.U.R. 1924-C 73	Water	7½	Reasonable
Louisiana Water Co. *v.* Mo. Pub. Serv. Com. (U.S. Dist. Ct.) P.U.R. 1924-C 293, 294F954	Water	8	Reasonable
Wis.-Minn. Light & Power Co. *v.* Wis. R.R. Com., P.U.R. 1924-C 534, 197 N.W. 359	Gas	5.8	Non-confiscatory
Joplin Gas Co. *v.* Mo. Pub. Serv. Com. (U.S. Dist. Ct.) P.U.R. 1924-D 137 (296F271)	Nat. Gas	6	Confiscatory
Streator Aqueduct Co. *v.* Smith (U.S. Dist. Ct.) P.U.R. 1924-D 261 (295F385)	Nat. Gas	4.62	Inadequate
Pacific Gas & Electric Co. *v.* San Francisco, U.S. Sup. Ct. P.U.R. 1924-D 817, 44 S. Ct. 557	Telephone	7	Minimum fair
Colorado Power Co. *v.* Helderman (U.S. Dist. Ct.) P.U.R. 1924-D 789, 295F178	Electric	8	Reasonable
Acquackanonk Water Co. *v.* P. U. Comrs. (N.J. Err. & App.) P.U.R. 1924-E 36 (125 Atl. 23)	Water	8	Not excessive
Georgia R. & Power Co. *v.* R.R. (U.S. Dist. Ct.) P.U.R. 1925-A 546	Gas	7	Non-confiscatory when it appears it will increase
N. Y. Teleph. Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1925-A 491, 300F822	Telephone	8	Customary and reasonable
R.R. Comrs. *v.* Hughes Electric Co. (N.D.) P.U.R. 1925-A 18	Electric	7½	Plus Federal Income Taxes allowed efficient company
Modoc Co. Dev. Board *v.* Altmas El. Power Co. (Calif.) P.U.R. 1925-A 823	Electric	8	Allowed subject to deduction for poor service and interest on depreciation reserve

Pacific Coast Elevator Co. *v.* Dept. of Public Works (Wash. Sup. Ct.) P.U.R. 1925-B 618, 228 P 1022	Warehousing	10	Non-confiscatory
Cons. Gas Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1925-B 773, 6 F (2d) 243	Gas	6	Confiscatory
Spear *v.* Van Dyke (Ariz.) P.U.R. 1925-C 59	Electric	10	Reasonable — mining district
Ohio Util. Co. *v.* P. U. Com. (U.S. Sup. Ct.) P.U.R. 1925-C 599, 267 U.S. 359	Gas & Electric	5	Confiscatory
Kings Co. Lighting Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1925-C 705, 7 F (2d) 192)	Gas	2.48	Confiscatory
Consolidated Gas Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1925-C 744, 6 F (2d) 243	Gas	8	Customary and reasonable
Duluth St. Ry. Co. *v.* Minn. R.R. & Warehouse Com. (U.S. Dist. Ct.) P.U.R. 1925-D 226, 4 F (2d) 543	Street Ry.	7½	Approved
Chesapeake & P. Teleph. Co. *v.* Whitman (U.S. Dist. Ct.) P.U.R. 1925-D 407, 3 F (2d) 938	Telephone	6	Minimum
S.W. Bell Teleph. & Teleg. Co. *v.* R.R. Com. of S. C. (U. S. Dist. Ct.), 5 F (2d) 77	Telephone	8	Fair return
N.W. Bell Teleph. & Teleg. Co. *v.* Spillman (U.S. Dist. Ct.) P.U.R. 1926-A 330, 6 F (2d) 663	Telephone	5½	Unreasonable and confiscatory
Brooklyn Union Gas Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1926-A 412, 7 F (2d) 628	Gas	8 6	Reasonable and confiscatory
State ex rel. St. Joseph *v.* Busby (Mo. Sup. Ct.) P.U.R. 1926-A 803, 274 S.W. 1067	Gas	7½	Reasonable. Temporary. Commission retained control.

148. Chronological Table of Cases Bearing on Rate of Return, Cont'd

Case	Nature of	Per Cent Rates	Remarks
Ashland Water Co. *v.* R.R. Com. (U.S. Dist. Ct.) P.U.R. 1926-B 293, 7 F (2d) 924	Water	7	Not sustained—argument presented to effect that rate base under evaluated with 6% as an adequate return.
N. Y. & Richmond Gas Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1926-B 759, 10 F (2d) 167	Gas	8	Customary and reasonable
Springfield Gas & Electric Co. *v.* Public Service Com. (U.S. Dist. Ct.) P.U.R. 1926-C 858, 10 F (2d) 252	Gas	8	Minimum
Monroe Gas Light & Fuel Co. *v.* Mich. Pub. Util. Com. (U.S. Dist. Ct.) P.U.R. 1926-D 13, 11 F (2d) 319	Gas	7 6	Non-confiscatory Confiscatory
Pittsburgh & W. V. Gas Co. *v.* Pub. Serv. Com. (W. Va. Ct. App.) P.U.R. 1926-D 280, 132 S.E. 497	Nat. Gas	16.71	Return, Deprec. and Depletion—not confiscatory
Pacific Teleph. & Teleg. Co. *v.* Whitcomb (U.S. Dist. Ct.) P.U.R. 1926-D 815, 12 F (2d) 279	Telephone	7½	Minimum
P. U. Com. *v.* E. Providence Water Co. (R.I.) P.U.R. 1926-E 641, 133 Atl. 804	Water	5	Maximum obtainable under any rate schedule

McCardle *v.* Indianapolis Water Co. (U.S. Sup. Ct.) P.U.R. 1927-A 15, 272 U.S. 400	Water	7	Minimum
Attinger *v.* Cons. Gas Co. (U.S. Sup. Ct.) P.U.R. 1927-A 37, 272 U.S. 576	Gas	6	Confiscatory
Brooklyn Borough Gas Co. *v.* Prendergast (U.S. Dist. Ct.) P.U.R. 1927-A 200, 16 F (2d) 651	Gas	8	Minimum
United Fuel & Gas Co. *v.* Pub. Serv. Com. (U.S. Dist. Ct.) P.U.R. 1927-A 707	Nat. Gas	8	Reasonable after allowance of 3.65% to amortize plant
Aluminum Goods Mfg. Co. *v.* Laclede Gas Light Co. (Mo.) P.U.R. 1927-B 1	Electric & Gas	8 7	Maximum Minimum
Chesapeake & P. Teleph. Co. *v.* Vir. (Va. Ct. App.) P.U.R. 1927-B 484	Telephone	6	Non-confiscatory
State ex rel. St. Louis Water Co. *v.* Pub. Serv. Com. (Mo. Sup. Ct.) P.U.R. 1927-C 473	Water	7½	Allowed
Columbus Gas & Fuel Co. *v.* Columbus (U.S. Dist. Ct.) P.U.R. 1927-C 639	Nat. Gas	7.087	Non-confiscatory
Idaho Power Co. *v.* Thompson (U.S. Dist. Ct.) P.U.R. 1927-D 388	Electric	7	Non-confiscatory
Follett *v.* Seneca Water Co. (N.Y. Sup. Ct.) P.U.R. 1927-D 761	Water	7½	Not excessive
Celina *v.* P. U. Com. (Ohio Sup. Ct.) P.U.R. 1927-D 796, 116 Ohio 596	Nat. Gas	8	Allowed

CHAPTER XIV

THE COST OF PUBLIC UTILITY CAPITAL

149. The Free Flow of Capital *

. . . A tariff wall around one of our states is unthinkable. The wanton, senseless waste of it would not be tolerated; for example, Massachusetts levying a tariff on Kansas flour and Kansas in turn putting a tax on Massachusetts shoes shipped into the state. Yet among a majority of our states we have tax and other laws that maintain barriers against the free flow of capital. In fact, many of our states still levy indirect and extra tribute on the thrift of their citizens and on capital imported to build up the state and raise the standard of living of its people. It is not just a figure of speech when I term these barriers tariff walls, for indirectly they levy a tariff on imported capital just as surely as on imported goods. There are dozens of these tariff walls against the free flow of capital among the different states. Not only are they complacently endured, they are not even recognized as such. Worse, they are not intended for that purpose although they perpetrate an economic waste that runs into millions of dollars yearly which you and I and every other citizen must write off from his own pocketbook. They exist because of inadequate public understanding of the nature of modern business and of the proper relation of government to business.

To make my meaning more specific, let me give some examples and effects of these American tariffs, state against state. Some years ago one state adopted a law levying a 2 per cent tax on securities bought by its citizens and originating outside the state. The erroneous theory was that the law would keep money at home for development of home industry. Popular misconception fostered it against any and all sound counsel. The very

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* Excerpts from an address by Henry R. Hayes, President of the Investment Bankers Association of America and Vice-President of Stone and Webster, Inc., on "Some Public Aspects of Modern Banking," before the Finance Group Session of the annual meeting of the Chamber of Commerce of America, May 9, 1928; *Stone and Webster Journal*, XLIII (July, 1928), 12-16.

next session of the legislature, however, repealed the law. It had kept capital from coming into the state and had hindered home capital in obtaining that safety of employment which lies in broadly diversified investment. Meanwhile the state's industrial progress and the pocketbooks of its citizens paid a heavy penalty while the law was in force.

In that same state there is a great, nationally known enterprise that has been built up by many years of honest, tireless endeavor. It has been the means of providing employment for thousands within the state and has added greatly to the wealth of the community and to a higher standard of living. As a process in its wholesome growth this enterprise recently issued some millions of dollars in bonds, securities of such soundness and desirability that, although the interest return was only 4½ per cent, the issue was at once oversubscribed by reputable securities dealers throughout the country and sold to investors—large and small. Now let us see what may happen when such a bond of the highest and soundest type known to the business world goes into capital channels among the different states. First, however, let me call your attention to the fact that all the states, except two, have laws especially pertaining to the selling of securities and that almost every variety of regulatory provision may be found among these acts. In almost all the states where the bond was offered, the authorities did not question its soundness and honesty. It was the kind of security that they like to see sold in their states. In state A, in the Middle West, for example, a broad-minded, and much-experienced securities officer quickly approved the bond. In state B, adjoining state A, both with almost identical economic and social conditions, the securities commissioner, also a wholly upright man and capable official, refused to allow the bond to be sold in the state. I repeat the incident as told to me by a well-known securities dealer within the state and an officer of one of the soundest financial institutions of that state.

When this local securities dealer in state B subscribed for these bonds to sell to his customers, he made application to qualify them in the state; that is, he sought official approval, as the law requires. Then, as the law in that state permits, pending final approval, he sold the bonds, knowing well that they were among the highest type of securities obtainable. He even had difficulty placating several experienced investors because he could not obtain sufficient bonds to satisfy the demand. Then to his surprise, the state's authorities asked a certain form of appraisal of the enterprise's properties. He couldn't give it because the business had been built up steadily year by year to such a huge size no one but the company had information as accurate as the information they desired. ''In the absence of that particular form of valuation,'' said the state official, ''an earnings statement would suffice.'' ''Splendid,'' replied the dealer, ''we can tell you the complete history of every dollar the enterprise has or ever has had.'' ''Yes, but we must have it divided up as from each individual unit of the enterprise,'' was the official reply. The dealer wished to know what good that would do, so long as the earning records accounted for every penny and the information on hand established the absolute soundness and honesty of the enterprise and the security. To supply the information in the form desired would have required months of hard work and an expense greater than the dealer's scanty profits. Rather than submit to this greater loss he bought back the securities at considerable trouble and expense and shipped them out of the state.

Now in this whole transaction there was never any question of possible fraud. The officials knew and admitted the bond was sound, honest, and desirable, but the law required certain red-tape procedure and they were powerless to do otherwise. As a result, a worthy securities company within the state was penalized for the sake of red tape.

Now let us follow this bond further, from the Middle West to the East into state X, one of the most conservative and largest bond markets. Experienced investors eagerly absorbed the issue and there was not the shadow of a question, official or unofficial, as to the high character of the bond. Then a savings bank started to buy some of the bonds and immediately state authority forbade.

''What's the matter with the bond?'' an investment banker asked. ''Can you name in its class a better, a sounder, more conservative issue?'' State authority replied that it wasn't a question of soundness, honesty, gilt-edge security and all the excellent qualities that make up a high-grade investment. The point was that the corporation that issued the bond was incorporated in state Y and was conducting its business in state Z. For that reason its bond could not be sold to savings banks in state X. . . .

When we add a consideration of how the unequal, varied and peculiar tax laws of the different states impose additional, unnecessary burdens upon the capital market and the thrift of individuals, we can begin to comprehend the hugeness of the economic waste arising therefrom. For example, state H, which is one of the richest in the Union, favors stocks, as against bonds, in its tax laws. As a result, state H is less interested in bonds. If your community builds a high school or a hospital or has need for credit for some other important public improvement, don't think that you do not pay for the fact that state H is, partly at least, out of the market for a proportionate share of your school or hospital bonds. You pay, and so does every other community. Narrow the markets of and the free trade in capital or any other commodity among the states, and some one foots the bill. Usually it is the public. . . .

It is not especially onerous that a new issue of bonds may require the paying of a small fee in each of as many as forty states before the issue can be sold in those states. Although the total of such fees may amount to a large fortune in the course of a year, it is money well spent if it measurably lessens the traffic in fraud. When, however, the law gives most of its attention to policing honest business instead of apprehending and punishing fraudulent dealers, when throughout the many states the reputable investment banker is compelled to supply elaborate information in one form here, in another there and is continually bound with useless red-tape, then I must protest that the law has strayed far from its purpose and the millions of dollars of unnecessary expense it imposes on honest business is little less than an outrage on the public that it should protect, not penalize.

When we consider further that often it is impossible to predict under what conditions of law and regulation capital may be obtained in a given state this week or next, we can add, in the aggregate, another stupendous amount to the cost of capital in this country. . . .

150. Elements in the Cost of Money to Public Utilities 1914-1922 *

With strict regulation of rates of service, rates of return, and various other factors in the investment bargain, utilities have had to finance their operations on close margins. Generally speaking, smaller margins require greater attention to the costs of financing. Particularly during the unsettled conditions of the

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* Frank Parker, *Journal of Land and Public Utility Economics*, II (1926), 73-92.

TABLE 71

Cost of Obtaining Money to Public Utilities in the United States Through Sale of Bonds, Notes, and Stock
January, 1914–December, 1922, Inclusive

Year	Par Value A (Dollars)	Price Received by Company from Bankers B (Dollars)	Bankers' Sales Price C (Dollars)	Bankers' Commission D (Dollars)	Percentage Cost of Money $\frac{D}{B}$
Bonds					
1914	67,570,000	62,176,518	65,676,101	3,499,583	5.628
1915	80,765,000	73,946,029	78,306,090	4,360,061	5.896
1916	77,565,900	70,243,895	74,591,317	4,347,422	6.189
1917	63,530,000	58,995,509	61,899,215	2,903,706	4.922
1918	39,150,000	34,824,647	36,933,512	2,108,865	6.056
Total 1914–1918	328,580,900	300,186,598	317,406,235	17,219,637	5.736
1919	130,496,000	122,082,433	127,909,428	5,826,995	4.773
1920	152,566,000	136,429,016	145,125,260	8,696,244	6.374
1921	300,822,100	272,866,857	289,173,467	16,306,610	5.976
1922	220,715,800	200,448,927	213,361,339	12,912,412	6.442
Total 1919–1922	804,599,900	731,827,233	775,569,494	43,742,261	5.977
Total 1914–1922	1,133,180,800	1,032,013,831	1,092,975,729	60,961,898	5.907
Notes					
1914	19,400,000	18,604,950	19,234,650	629,700	3.385
1915	15,090,500	14,442,616	14,928,491	485,875	3.364
1916	17,731,000	17,342,244	17,677,857	335,613	1.935
1917	33,902,600	32,131,596	33,566,857	1,435,261	4.467
1918	75,104,800	70,677,968	73,464,314	2,786,346	3.942
Total 1914–1918	161,228,900	153,199,374	158,872,169	5,672,795	3.703

1919		134,550,000	128,691,500	132,887,265	4,195,765	3.260
1920		85,575,500	80,786,568	83,673,450	2,886,882	3.573
1921		41,450,000	40,329,820	41,394,660	1,064,840	2.640
1922		3,250,000	3,068,500	3,183,250	114,750	3.740
	Total 1919–1922	264,825,500	252,876,388	261,138,625	8,262,237	3.267
	Total 1914–1922	426,054,400	406,075,762	420,010,794	13,935,032	3.432
	Stock					
1914		3,104,500	2,744,500	2,927,635	183,135	6.673
1915	There were no issues of stock made during 1915 for which complete information was available.					
1916		250,000	250,000	257,500	7,500	3.000
1917		2,000,000	1,830,000	1,995,000	165,000	9.016
1918		345,000	345,000	362,250	17,250	5.000
	Total 1914–1918	5,699,500	5,169,500	5,542,385	372,885	7.213
1919		7,535,000	6,480,400	6,854,650	374,250	5.775
1920		2,395,000	1,345,500	1,555,000	209,500	15.570
1921		12,820,000	12,145,000	12,869,000	724,000	5.961
1922		20,168,600	17,675,995	19,629,806	1,953,811	11.053
	Total 1919–1922	42,918,600	37,646,895	40,908,456	3,261,561	8.664
	Total 1914–1922	48,618,100	42,816,395	46,450,841	3,634,446	8.488
	Grand Total	1,607,853,300	1,480,905,988	1,559,437,364	78,531,376	5.303

past decade the cost of money to utility financiers has been of great importance. This study, it is hoped, will contribute to the understanding of the fluctuations in the cost of money to utilities, when needed funds are raised by bond, note, or stock issues.

Cost of Money Defined. The cost of financing to public utility companies is composed of two distinct elements: (1) the mechanical cost of financing, including therein all costs of preparing, printing, engraving, registering, and distributing security issues, whether stock, bonds, or notes, as well as the cost of recording mortgages and other necessary papers, trustees' fees and expenses, and so forth; and (2) the cost of obtaining money realized from the sale of such securities, whether such cost be incurred in the form of direct expenses paid by the company—where securities are sold direct by the company to the investor—or as sums paid to bankers for their services in affecting the sale of the company's securities.

The first group of expenses is capable of exact determination by examining the records of the particular utility. Inasmuch as it constitutes a relatively small part of the total cost of financing, seldom exceeding 1 per cent of the total property investment, and since the ascertainment of the exact amounts expended on the mechanical cost of financing presents unusual difficulties, no extended consideration will be given here to this phase of the cost of financing. Provision is made in substantially all of the classifications of accounts promulgated by the various public service commissions throughout the United States for including in the capital accounts the exact costs as recorded on the books of the public utility company incurred in the printing, engraving, registering, and distributing of securities.

The cost of obtaining money, or brokerage, as it is sometimes termed, must not be confused with discount, which represents the difference between the par value of securities and the price paid therefor by individual investors. This difference is an adjustment of the interest rate which, when averaged over the life of the bond—in conjunction with the interest periodically paid by the company—gives the investor an average yield approximating the current yield for securities of the character in question. As distinguished from discount, the cost of obtaining money represents the difference between the price at which securities are sold to the banker by the utility and the price at which the banker in turn sells them to the investing public. It includes a reasonable compensation for the banker's services in marketing the securities and forwarding the funds yielded to the utility; the services and expenses of examination, negotiation, advertising, and selling through all of the various stages until the sale to the final investor is effected.

Factors Affecting the Cost of Money. Considerable study has already been given to the relative advantages of bond, note, and stock financing in different periods of the business cycle. It is also well known that the costs of borrowing from creditors in return for bonds or notes and of raising funds by stock issues vary markedly from time to time. This is the background of the present study and it may be appropriate to mention briefly the outstanding factors that affect the cost of obtaining money; namely, (1) the existing conditions in the money market, (2) the type of security issued, (3) the general reputation of the type of enterprise seeking the capital, (4) the location of the enterprise, (5) the extent to which the territory served has been developed, (6) the present earning power of the property, (7) the degree to which speculative risks are involved, and (8) the character and extent of local and state regulation and control to which the utility is subjected.

No extended explanation need be given of most of the foregoing factors. Professor W. C. Mitchell has made a careful analysis[1] of fluctuations in the money and investment markets and in the salability of bonds and stocks during the various phases of the business cycle. For the present purpose one needs to consider only two of the foregoing factors; namely, the general reputation of the type of enterprise seeking capital, and the effect of local and state regulation on the utility's financial standing.

The general reputation of the type of enterprise seeking capital plays a significant rôle in determining the cost of obtaining money. By type of enterprise is meant public utilities as distinguished from industrial enterprises; steam railways likewise are excluded from the present analysis although recognized as public utilities. From 1900 to 1920 the investment standing of many public utility securities progressively declined in the estimation of investors, and this decline in popularity accounted for the increasing cost of money to individual public utility enterprises. The lack of a carefully conceived policy of public relations, the inability of utility managers to foresee an unprecedented growth in the industry, and hence their failure to make adequate provision for extensions and improvements to meet the

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[1] W. C. Mitchell, *Business Cycles* (Berkeley: University of California Press, 1913).

TABLE 72

COST OF OBTAINING MONEY THROUGH SALES OF PREFERRED STOCK LOCALLY

APPROX. DATE OF OFFERING	COMPANY NUMBER	DESCRIPTION OF SECURITIES SOLD	PAR VALUE A (Dollars)	NET AMOUNT REALIZED BY COMPANY LESS EXPENSE OF SELLING B (Dollars)	PRICE RECEIVED BY COMPANY FROM BUYER C (Dollars)	SELLING EXPENSES D (Dollars)	PERCENTAGE COST OF MONEY $\frac{D}{B}$
5-5-22	230	6% Cumulative Preferred......	73,000	58,863	61,320	2,457	4.17
1919-1923	21	6% Preferred	3,456,660	2,800,617	2,973,447	172,830	6.17
2-14-22	229	Preferred	201,200	186,160	201,200	15,040	8.08
July 1922.......	53	7% 1st Preferred.............	331,200	314,350	331,200	16,850	5.36
1-1-22	231	7% Cumulative Preferred......	22,650	21,650	22,650	1,000	4.62
to 12-31-19......	66	7% Cumulative Preferred......	90,600	84,502	90,600	6,098	7.22
1-1-20 to 8-3-20..	66	7% Cumulative Preferred......	66,300	57,937	66,300	8,363	14.43
4-11-21	76	8% Preferred	1,200,000	1,164,000	1,200,000	36,000	3.09
June, 1920, and Aug., 1921....	232	8% Cumulative	465,000	438,707	465,000	26,293	5.99
1921	86	7% Cumulative Preferred......	2,449,800	2,014,970	2,082,330	67,360	3.34
1922	86	7% Cumulative Preferred......	4,424,600	3,861,552	3,926,833	65,281	1.69
1921	99	8% Preferred	3,027,300	2,888,429	3,027,300	138,871	4.81
1922	99	7% Preferred	1,910,100	1,826,518	1,910,100	83,582	4.58
1918	233	7% Preferred	264,800	256,456	264,800	8,344	3.25
5-16-21	234	6% Cumulative Preferred......	995,925	690,174	756,903	66,729	9.67
6-4-20 to 8-31-22.	129	7% Non-Par Cumulative Preferred	2,990,200[a]	2,540,666	2,804,243	263,577	10.37

[a] 29,902 shares (no par value) redeemable, in case of liquidation, at $100 a share.

1921-1922	135	7% Cumulative Preferred	1,354,400	1,204,103	1,280,376	76,273	6.33
5-23-21	199	8% Cumulative Preferred	6,335,400	6,161,177	6,335,400	174,223	2.83
5-7-17	171	7% Preferred	7,000,000	6,650,911	7,000,000	349,089	5.25
10-16-22	236	7% Cumulative Preferred	158,400	150,226	158,400	8,174	5.44
1-15-21	176	7% Cumulative Preferred	1,220,000	1,172,505	1,220,000	47,495	4.05
1920-1921	214	6% Preferred	121,700	103,445	108,313	4,868	4.71
1921-1922	214	8% Preferred	275,700	264,672	275,700	11,028	4.17
July, 1921	188	7% Cumulative Preferred	3,544,800	3,298,791	3,367,560	68,769	2.08
July, 1919	238	6% Cumulative Preferred	3,093,400	2,474,101	2,536,588	62,487	2.53
8-22-19	237	7% Preferred	441,800	423,752	441,800	18,048	4.26
Mar., 1920	239	7% Preferred	500,000	490,765	500,000	9,235	1.88
Oct., 1920	239	7% Preferred	1,000,000	953,000	1,000,000	47,000	4.93
Apr., 1922	239	7% Preferred	500,000	476,755	500,000	23,245	4.88
			47,514,935	43,029,754	44,908,363	1,878,609	4.366
1914-1922	242	....	....	....	....	....	$5 per Share
....	240	....	....	....	....	....	$5 per Share
....	245	....	....	....	....	....	$5 per Share
....	244	....	....	....	....	....	$5 per Share
....	246	....	....	....	....	....	$5 per Share
....	241	....	....	....	....	....	$5 per Share
....	247	....	....	....	....	....	$5 per Share
....	243	....	....	....	....	....	$5 per Share

demand for their services, the difficulties of adjusting their rates and service to meet the stringent regulations of the public service commissions, and the limitations to which a fixed rate of return subjected all public utilities during the period of the pronounced rise in prices from 1914 to 1920, made serious encroachments on profits and resulted in turning the interest of investors toward other fields. Moreover, the greater effort and larger expenditures necessary to sell public utility securities caused an increase in the cost of obtaining money in the post-war period as contrasted with pre-war days. This increased difficulty in selling public utility securities was due partly to the decrease in accumulated savings following the destruction and waste of capital during the World War, and also to the fact that the surtaxes under our income tax laws convinced the large investor of the economy of buying securities that were tax-free. As a consequence, the average sales per capita of all classes of securities, except municipals and government securities, declined substantially from 1918 to 1921. Figures based upon the records of a large bond house with a nation-wide organization and clientele show that as of 1921 the average sale per capita had dropped from $23,000 to $8,000; in order to sell 24 bonds in denominations of $1,000, it was necessary to sell to three people instead of one. This decrease in the amount of sales per capita meant that to sell a given amount of securities the banker was obliged to see a great many more prospects, to spend more time, and to incur greater expenses in advertising and circularizing, and this increased cost of doing business to the banker partially explains the increased cost of money to public utility enterprises.

Speculative risk as an item affecting the cost of obtaining money to public utilities is closely associated with local or state regulation and control. Ordinarily, a public utility enterprise established in a community giving reasonable promise of continuous growth and administered by officials possessing technical knowledge and operating experience, is much more fortunately situated with reference to making profit than an industrial or mercantile enterprise doing business in the same locality. Comparative freedom from competition, and the assurance of such freedom continuing as long as commission regulation lasts, coupled with the rendition of services that are today deemed indispensable to the community, gives a degree of safety to the bonds, notes, and stocks of utilities that the securities of the usual private enterprise lack. Exception should probably be made of utilities operating under short-term franchises.

Yet legislative and administrative control of utilities through state statutes and state public service commissions also entails risks to the investor that are reflected in the cost of obtaining capital. Uncertainties as to safety of principal and income incident to commission appraisal of the fair value of the property and changes in policy in fixing the rate of return inevitably add to the cost of obtaining money. Reduction of overhead allowances to a bare minimum, flat refusal to recognize promotion fees and expenses as legitimate expenditures in the construction and development of a property, failure to grant reasonable allowance for development cost, going concern value, and working capital—not to mention, perhaps, unduly severe paring of the value assigned to the physical property—all tend to reduce the rate base upon which the investor's original contribution to the utility was grounded and thus make it impossible to attract additional capital except at an appreciably higher cost.

Relation between Rate of Return and Cost of Money. Most of the influences exerted by regulatory bodies on the cost of money can be focused in the rate of return. Clearly a direct correlation exists between a reasonable return—not merely a non-confiscatory return which is largely a legal matter—and the attraction of capital into the utility field. If the rate of return is not high enough to compensate efficient management and labor as well as to compensate the contributors of capital funds, while keeping the property unimpaired, obviously, then, the service, earnings, and credit position of the utility will suffer, while the cost of obtaining funds for maintenance and expansion of service will proportionately rise. Of course, the rate of return does not fix the cost of obtaining money; it merely determines the conditions under which money can be acquired. But in so far as the rate of return functions as a provider of earnings, money will cost more or less as the conditions created by the rate of return destroy or encourage the investors' confidence.

151. The Risk Factor in the Cost of Capital *

A very brief study of the literature of finance or a short discussion with anyone familiar with security values is sufficient to impress one with the thought that the market price of a security at any time is related to the risk assumed by the investor who purchases it. While the various ratings are of some service in comparing risks, they fall short of being a satisfactory measure of value in two important respects. They not only fail to show how much better one bond is than another, due to the fact that the ratings are symbols to which no numerical value is assigned, but they also fail to carry conviction because the relative weight of the factors upon which they are determined is not disclosed by those who establish them; and in using them one is forced, therefore, to accept blindly the judgment of those responsible for them.

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* Excerpts from Halbert P. Gillette and Alfred S. Malcomson, "A Precise Scale of Utility Bond Yields and Risks," *The Annalist* (November 12, 1926), 627.

So far as the authors have been able to discover no one has yet stated that there is a definite mathematical relationship between risk and yield; nor has any one promulgated a formula by which it may be measured. It is the purpose of this article to establish the existence of such a formula and to describe the process by which it may be derived. Its significance and its relationship to the cycle of bond prices, as well as its application to investment problems, are also explained.

At the outset it is important to note that the facts herein presented, excepting as otherwise specifically stated, relate only to simple mortgage bonds of public utilities having an unexpired term to maturity in excess of ten years, although the conclusions apply in general to bonds of similar character in other industries. The valuation of short-term bonds, convertible and guaranteed issues, and debentures, often involves other factors. Collateral trust bonds, however, are so closely related to mortgage bonds that they may ordinarily be included with them. The term *yield* refers throughout to the yield to maturity, and not to coupon or current yield.

It is widely recognized that the safety of a given bond, hence the yield at which it should sell, is indicated in some measure by the number of times its fixed charges are earned.

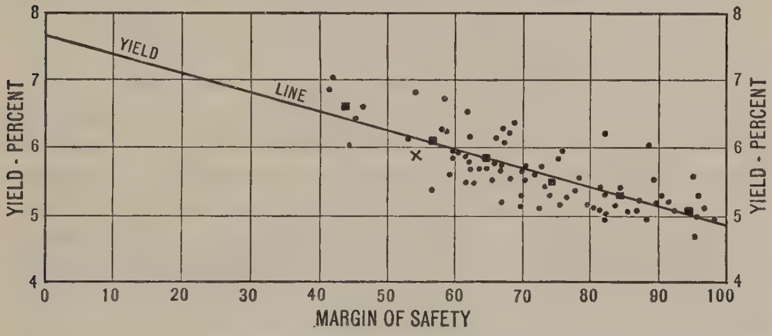
There is, however, a similar yardstick known as the margin of safety which is occasionally used, and for a number of reasons it is the more satisfactory unit to adopt for present purposes as the measure of safety of bonds. . . .

There is a mathematical interrelationship between these two yardsticks, and the one can be converted to the other by a very simple process. If it be desired to convert the number of times bond interest is earned into margin of safety, it may be done by dividing the former into one hundred and subtracting the result from one hundred. Thus two and one-half times bond interest is the equivalent of a 60 per cent margin of safety.

Similarly, if the margin of safety be known and the number of times interest is earned be desired, subtract the margin from 100 and divide the remainder into 100. Thus it will be found that a margin of safety of 70 per cent is the equivalent of three and one-third times bond interest earned. . . .

The accompanying chart depicts the result of plotting the computed margins and yields of 78 public utility bonds, the market prices and other necessary data of which were published for the four-year period, 1922 to 1925 inclusive. At the bottom of the chart is shown the horizontal scale of margins, while on either side appears the vertical scale of yields. Thus to plot a bond having a margin of 54.3 per cent and a yield of 5.91 per cent follow along the bottom of the chart to a point nearly halfway between the vertical lines which are marked 50 and 60. Then follow upward nearly to the horizontal line marked 6. This point as plotted is marked with an X and it is the graphic representation of the position of the 5 per cent bonds of the Philadelphia & Western Railway, which had an average margin of 54.3 per cent and an average yield of 5.91 per cent during the period mentioned. There is also shown on the chart a number of heavy black squares which indicate the average of those points lying between each ten-point spread of margin, and the yield line is drawn along these averages. For example, the square lying just above the yield line and nearest to its left-hand end represents an average of the 5 points having a margin of more than 40 per cent and less than 50 per cent.

Chart 62—Computed Margins and Yields of 78 Public Utility Bonds



The definiteness of this relationship between yield and margin of safety is shown clearly on this chart. It indicates convincingly that the largely controlling factor in the minds of investors when they appraise the value of a given bond by purchasing it at a price which will produce for them a certain yield is the margin of safety of that bond; or the related unit—the number of times bond interest is earned.

The yield line on the chart really represents and reveals, therefore, the consensus of the opinions of countless investors as to the relationship between yield and risk of public utility bonds in that period. It provides furthermore a much more definite means of testing the value of public utility bonds which an investor may be thinking of buying than has heretofore been available, because it establishes a definite quantitative relationship which anyone can readily apply.

Take for instance the Buffalo General Electric first 5's of 1939, having an average margin of 95.3 per cent and an average yield of 4.99 per cent. Contrasted with these we have the first and refunding 5 per cent bonds of the Mountain States Power Company, due 1938, having an average margin of 45.4 per cent and an average yield of 6.42 per cent.

Both of these bonds can be readily identified on the chart, and it will be observed that they both lie just on the line, but that the difference between their yields is nearly 1½ per cent. The investor comparing these bonds may know that the former were rated throughout the period as Aaa and the latter as Baa, but without a more definite means of appraising risk he would be left somewhat uncertain as to whether if he bought Mountain States Power bonds the additional yield which he would thereby secure would be sufficient to compensate for the difference in risk between the issues. But with the yield line before him he is able to see at a glance that, while he is taking a greater risk in buying Mountain States bonds, he is nevertheless getting additional yield which fully compensates him therefor, provided there are no other factors of substantial amount in either bond for which adjustments must be made. And if, in fact, he is really adequately compensated for the greater risk by receiving the higher yield, and if that risk is one which his investment program justifies him in taking, he could with confidence decide to buy the Mountain States Power bond rather than the Buffalo General Electric bond. . . .

The spread between the actual yield of a bond and the normal average represents the net result of adjustments made in the minds of investors for such factors as managerial efficiency and ability, trend of the industry or of the individual company, tax exemption features, marketability, legality as investments for savings banks and so forth, together with such over or under valuation as may exist, due to failure on the part of the public to recognize true intrinsic value. . . .

If an investor be considering the purchase of a bond the interest on which is earned three times he can readily determine that its margin of safety is 66⅔. From the chart he can then determine that the normal average of bonds at that margin of safety yield 5.81 per cent.

If he is at the same time considering a bond the interest on which is earned ten times he finds its margin of safety is 90 per cent and that its normal average yield should be 5.16 per cent.

If then he finds that the price he must pay for the first bond will yield 6 per cent, or 0.19 per cent more than the average, whereas the second bond will yield him only 5 per cent or 0.16 per cent less than the average, and if a careful analysis does not disclose any other factors of importance other than failure of the individual securities to have reached their proper level, he can with some confidence feel that he is getting better value if he purchases the first rather than the second bond. . . .

At this point it is perhaps desirable to point out that the market value of a bond frequently differs from its intrinsic value because of the failure of investors to recognize what that intrinsic value is. . . .

Comparing a bond with the yield line permits an investor, when he considers buying or selling it, to weight his bargain with some definiteness, and perhaps to take some profits which he might otherwise overlook. He can figure closely how much its tax exemption features are worth to him; and if, in addition, it offers special features, such as marketability or stability of earnings or managerial ability he can in some measure decide how many dollars per bond each of these factors is worth to him. Adding together the favorable items and deducting the unfavorable ones will produce a net result representing the addition or deduction to be made to the normal price in order to determine its intrinsic worth to him. The normal price he then determines by figuring the margin of the bond and finding from the yield line what the normal yield should be. A bond table converts this to normal price, and a comparison of it with the intrinsic value shows him how much of a bargain he is getting—or has.

It is essential to observe at this point that the individual characteristics of the bond and of the company by which it is issued must be studied with sufficient care to disclose all supplementary items of consequence which affect the value. The trend of the bond toward or away from each year's line over a period of years, compared with its relations to the average line, is often in itself enlightening in this respect, as may also be the ratings. In considering industrial bonds, for which a similar but differently placed line exists, serious errors may be made if a bond be judged by its position in a single year, for the temporary effect of the business cycle on earnings and therefore on margins and yields may be substantial in any one year.

Furthermore, the effect of cyclical changes in bond yields is a matter for separate consideration. The intrinsic value of a bond at any time is related to concurrent interest rates, and it will vary from time to time in consonance with them. The yield line simply indicates intrinsic worth at a certain date and not a value which will necessarily continue constant.

The data on which this yield line is based place depreciation or retirement reserve allowance, as well as Federal taxes, in the operating expenses, and therefore the computation of the margin of any bond being tested by it must be made on the same basis. It has become the practice of some bond houses in offering new issues to publish net earnings before deduction of depreciation and taxes, and in such instances if the actual figures cannot be had some estimate of and adjustment for them must be made. Failure to do so would result in too large a margin and indicate a greater degree of safety than actually exists. Sometimes, also, it is necessary to make an adjustment to compensate for the effect of an active selling force behind a bond which results in maintaining a price that will not endure after support is withdrawn.

It may be stated in conclusion that there is a change in the position of the yield line from year to year, and that it not only rises and falls in consonance with the fluctuations of the bond market but that it also requires from time to time a flatter or a steeper slope. These variations, however, have not been great in the last few years, and the four-year average line does not therefore differ widely from those of the individual years in the period covered and that of the present time, although, of course, the use of the individual lines is of great value where it is desired to study the trend of any given bonds.

152. The Cost of Borrowed Capital for Public Utilities *

The period necessary for capital turnover in public utilities is considerably longer, in the typical case, than is ordinarily

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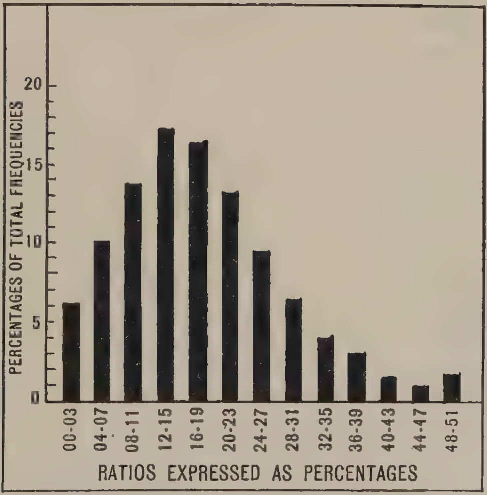
* Excerpts from O. Gressens, *The Annalist* (March 18, 1927), 397-8.

assumed. This means, of course, that the gross revenues of a typical public utility company are only a fractional part of the invested capital in any one year. . . .

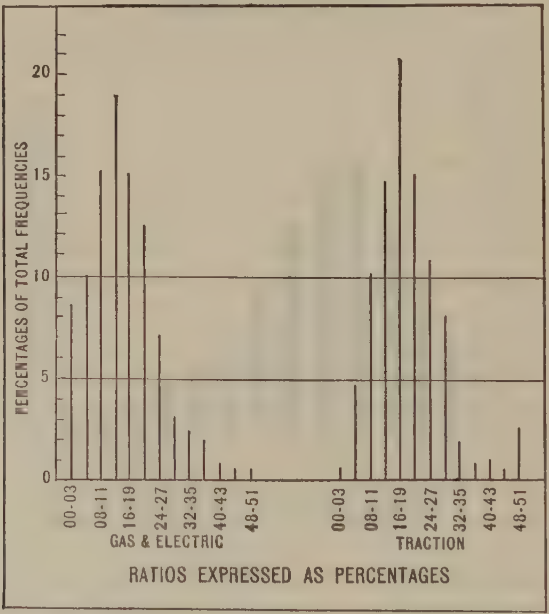
The problem in the distribution of revenues is the determination of the proportionate amounts necessary to meet fixed charges. In other words, it is the determination of the proportion of gross revenues which is necessary to meet the cost of borrowed capital. . . . A great many variations are met in the proportionate amounts of gross revenues which are necessary to meet these charges. Here again, however, there is a definite tendency toward concentration about a single value of the ratio. This concentration centers about the class interval .12-.15. It is within these limits, therefore, that the approximated typical ratio lies. The calculated value of this ratio is .14. Considering these utilities together, in other words the expectation, in the typical case, would be that 14 per cent of gross revenues are necessary to pay the cost of borrowed capital.

Chart 63—Percentage of Gross Revenues Required to Pay Cost of Borrowed Capital.



The concentration about this value of the ratio is indicated by the fact that 47 per cent of all ratios occur in the three class intervals .08-.11, .12-.15, and .16-.19. Three out of the thirteen class intervals, therefore, contain almost one-half of all of the calculated ratios of fixed charges to gross revenues. The variations from the value of the typical ratio, .14, however, range from less than .03 to .51. There is no question but that the type of public utility, the type of customers which it serves, the financial history of the company and the business policy of its management, together with the characteristics of the locality in which the company operates and the markets in which it is forced to seek its capital, all combine to determine the amount of money which the particular company needs to pay for its borrowed capital. . . .

Chart 64—Gas and Electric, and Traction Gross Revenues in Relation to Fixed Charges.



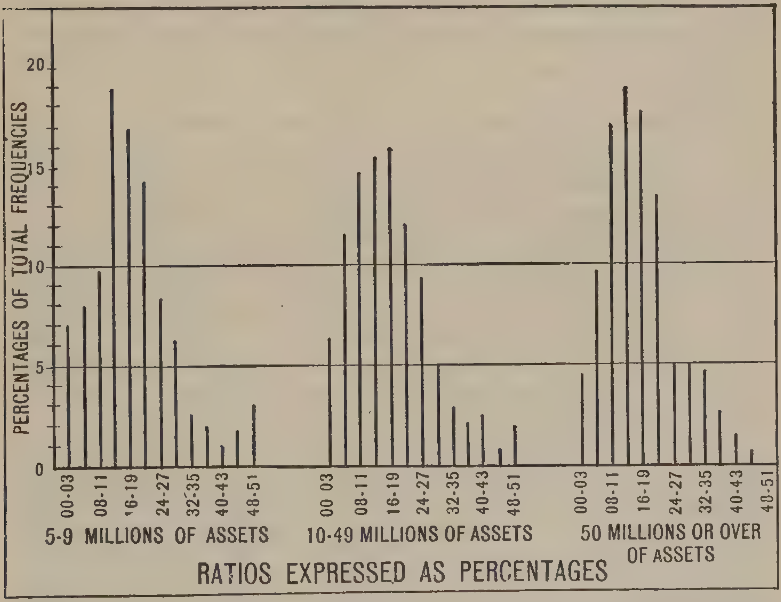
Separating these ratios, therefore, first of all, according to the kind of service rendered, we have the two groups: (1) gas and electric light and power companies, and (2) traction companies. The typical ratios approximated from these distributions are .14 and .18 for the gas and electric light and power companies, and for the traction companies respectively. Thus, in the typical case, it is correct to say that the gas and electric light and power companies appropriate less of gross revenues to pay the fixed charges on borrowed capital than do the traction companies.

The concentrations about the typical values of these two groups are indicated by the following:

Gas and Electric Cos.	Traction Cos.
.08–.19	.12–.23
50%	51%

The three class intervals about the typical values for these two groups embrace 50 per cent and 51 per cent respectively for all of the ratios in these two groups. The central tendency in these two sub-groups of the utility companies included in this study is thus more marked than when all of the companies are thrown together.

Chart 65—Efficiency in Relation to the Size of the Operating Unit.



It is usually thought that efficiency is definitely associated with the size of the operating unit. Such units as are extremely small are usually considered to be less efficient than larger operating units. The lower limit of size commensurable with the best operating, and, for that matter, financial efficiency, varies necessarily with the kind of industry under consideration. Likewise, there is an upper limit, which again varies from industry to industry, beyond which the operating efficiency, at least, begins to decrease. It is interesting and important, therefore, to discover whether the size of the company makes a material difference in the proportion of gross revenues which are used in the payment of fixed charges in the case of the utility companies.

For this purpose there were divided into three groups (1) companies whose total operating assets range between $5,000,000 and $10,000,000, (2) companies whose operating assets aggregate between $10,000,000 and $50,000,000, and (3) companies whose total operating assets exceed $50,000,000. For these three groups the approximated values of the typical fixed charges to gross revenues ratios were found to be .14, .18 and .13, respectively. The concentrations about these values are indicated by the fact that the three class intervals about these typical ratios contained 45 per cent, 44 per cent and 54 per cent, respectively, of all the ratios in each of these groups. When it is remembered that these ratios were gathered into thirteen class intervals in each group the high concentrations within narrow limits are indicated.

It is difficult to explain these ratios on the basis of variations in the sizes of the companies. The two groups of smallest and largest companies are in better positions than the group of middle-sized companies from the point of view of the proportionate payments of gross revenues for fixed charges. More often small companies find it necessary to expend a larger proportion of gross revenues to meet fixed charges than do large companies. If this holds true for the entire industry, as it does for the companies herein included, then it is correct to say that, considering all public utility companies, the larger companies in this respect are more efficient than the smaller companies.

A last regrouping of these ratios was made by four type years in order to determine, if possible, whether or not changing conditions over a period of years influence materially the appropriations of gross revenues for fixed charges. The years were selected so as to reflect the effects of the so-called business cycle on these proportionate payments. The typical ratios calculated for these years are .17, .18, .14, and .14, respectively. The concentrations about these values are:

1917	1919	1921	1924
.12–.23	.12–.23	.08–.19	.08–.19
44%	47%	51%	53%

The justification for calling the above ratios typical is thus apparent. A significant factor during these years is the central tendency toward higher concentrations about lower ratio values. Smaller proportionate amounts of gross revenues are thus used for the payment of fixed charges. This is due in large part to the increase in gross revenues which public utility companies have experienced, particularly in the last few years.

These groups of ratios, however, do not disclose any effects of the so-called business cycle. If these movements had had any material effect on the gross revenues of public utilities, the ratios of fixed charges to gross revenues would have increased in depression years and decreased in years of prosperity. No such oscillations, however, are disclosed by these groups of ratios. This again substantiates an argument which was advanced in the consideration of the operating ratios of public utility companies. The movements of the so-called business cycle do not materially affect their gross revenues. Under present condition, public utility companies still form a relatively stable industry.

153. The Investment Yield on Public Utility Securities *

One of the major problems in public utility operation is that of securing the funds necessary for expansion, and the courts and commissions who have the power to determine the charges which shall be made for service are beginning to appreciate more fully the economic significance of their decisions, and to seek some definite criterion by which to test the fairness of the rate of return produced by the charges they allow. . . .

This article presents a method of establishing such a criterion as courts and commissions feel the need of. The method is based on a study of actual market yields from public utility securities in 1924, those yields showing what investment returns were sufficient, under the conditions of that year, to induce investors to put money into the utilities industry.

The flow of money into new securities is controlled by the same factors which influence an individual to purchase those which are already being dealt in, namely the prospective interest or yield which he will receive and the investment risk which he assumes.

If all utilities were financed solely by the sale of common stock the yield demanded by investors who were placing funds in that industry could be readily determined at any time. This yield at

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* Excerpts from Halbert P. Gillette and Alfred S. Malcomson, *The Annalist* (July 2, 1926), 3.

a given time would be found by dividing the total net earnings of the industry by the total market value of the stocks which were then outstanding. The result would be the rate which the investing public at large considered adequate as a return for the use of its money and one, therefore, which the industry must be permitted to pay in order to continue a normal growth. Any intention to foster a greater inflow of funds would necessarily be reflected in an allowance of a somewhat higher rate, whereas a lower one would inevitably tend to curtail expansion.

The corporate financial structure of most public utilities, however, is made up not only of common stock, but also of bonds and preferred stocks. A mortgage bond has first call on net earnings for payment of its interest charges; and because of the security thus granted to bondholders they are satisfied with a relatively low rate of interest. Preferred stockholders come next in line, receiving their dividends only if earnings remain after bond interest has been paid. Their investment risk being greater, the yield which they demand is therefore somewhat greater than the yield on bonds. Common stockholders, being the proprietors of the business, enjoy a return only if earnings remain after first paying bond interest and preferred stock dividends; and they accordingly insist on an even higher return on their money.

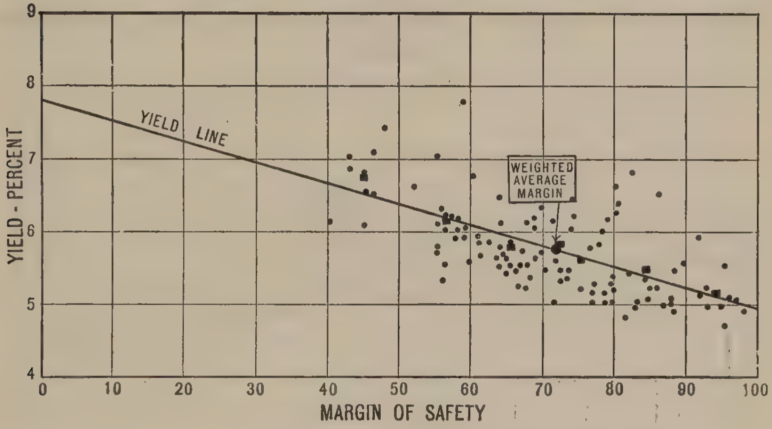
An approximation of the average yield demanded for either bonds, preferred or common stocks is not difficult; but the fact that the financial structure normally includes all three, and that each attracts funds at different interest or yield rates, makes it less simple to determine the composite yield demanded by investors for all of the money invested in the industry. If, however, the relative importance of bonds and each class of stock be known it is possible to determine a composite yield quite as definitely as could be done if bonds and preferred stocks were non-existent. . . .

As already noted, bonds carry relatively the minimum of risk, followed next by preferred stocks, leaving common stocks to take the maximum. But within each of these major classes of security there is a sequence of risk which causes a difference to exist between the yields of two given bonds or stocks. And each must therefore be analyzed in order to establish a suitable measure or unit of risk and then to discover the law of relationship between yields and risks.

In the case of bonds the key to the answer lies in the margin of safety, which may be defined as the percentage relationship existing between the earnings available for fixed charges and the earnings remaining after deducting the interest charges for a given bond and those of all prior liens. For example, if net earnings available amount to $100,000 and interest charges on bond "A," "B" and "C" amount together to $30,000 the margin of safety of bond "C" is 70 per cent.

A more familiar expression than "margin of safety" is the number of times interest is earned, and the two may be readily converted in the following manner: If the margin be known and the number of times interest be desired, subtract the margin from 100, and divide the remainder into 100. Thus, in the example stated above, subtract 70 from 100 and divide the remainder (30) into 100. The result is three and a third, which is the number of times bond interest is earned. And, vice versa, if the number of times bond interest be known and the margin be desired, divide the former into 100 and subtract from 100. Thus, two and one-half times bond interest is the equivalent of 60 per cent margin of safety.

Chart 66A—Margins of Safety and Average Yield—Bonds.

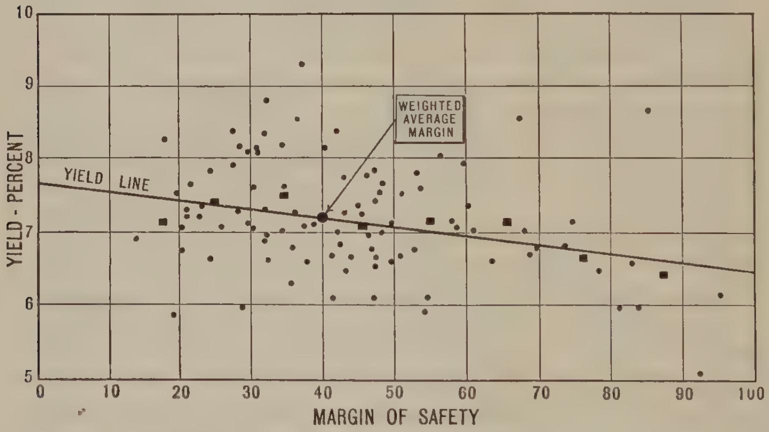


A tabulation of such margins computed for a number of utility bonds and of their concurrent yields at any given time makes it very apparent that there is a direct relationship between the two; and if the number be sufficient to average out the effects of individual characteristics inherent in each individual issue of bonds, a mathematical determination of the relationship becomes possible.

This relationship is graphically presented in Chart 66-A of bond yields, on which have been plotted the positions of a number of public utility bonds as determined by their respective margins of safety and average yields for the year 1924. These plottings have then been reduced to an average line by the method of least squares, and in order to more clearly indicate the relationship between the line and the plottings heavy black squares have been plotted to indicate the average of all plottings lying between each 10 points of margin.

A mechanical selection of the issues plotted was adopted, the details of which are too extended for the space here available, but which will presently be set forth at length elsewhere. Debentures, short-term issues, convertibles and income bonds were completely eliminated; and the selection was such as to confine the plotting to bonds of an investment character.

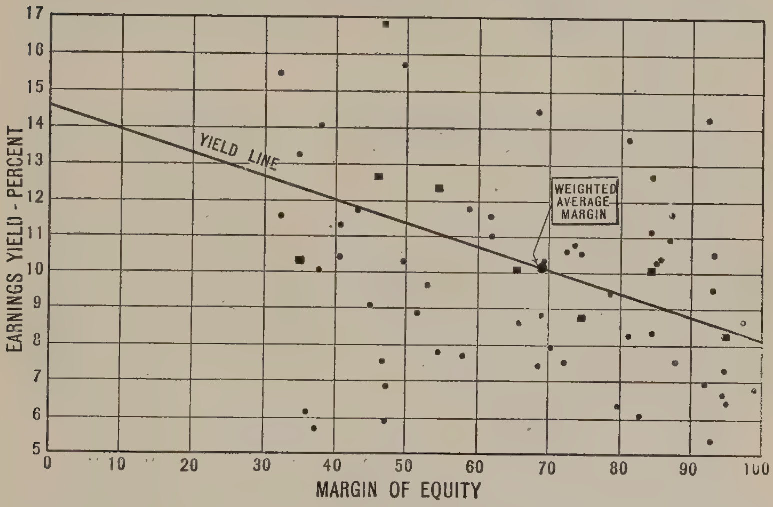
Chart 66B—Margin of Safety and Average Yield—Preferred Stocks.



This yield line therefore represents the consensus of the opinions of countless investors as to the relationship between yield and risk of utility bonds in 1924, resolved and equated into the simple and easily computed margin of safety. And from it may readily be determined the typical yield of utility bonds of any specified margin of safety or the margin which should accompany any specified yield.

Preferred stocks are treated in similar fashion and the results shown in the chart of preferred stock yields (Chart 66-B). As might be expected, the yield disclosed at zero margin is substantially equal to that for bonds at the same margin, for the risk is about the same in both cases. The definition of margin of safety for preferred stocks is identical with that for bonds, the percentage being related to the net earnings before rather than after interest charges. Thus it will be seen that a preferred stock will never have a margin of safety greater than that of such bonds as may underlie it. Only cumulative stocks not in arrears have been included in the determination, and convertibles were eliminated. The method of plotting is the same as that used for the bond chart.

Chart 66C—Margin of Equity and Average Yield—Common Stocks.



Common stocks present a slightly different problem. A margin of safety such as that above defined does not exist, for the common stockholders are the proprietors of the business and own the entire equity. It is not uncommon to think of "dividends" as representing the entire earnings of the common stock, or proprietary interest, but this is erroneous, because common stock dividends are merely that portion of earnings which the directors decided to distribute at a given time. A line plotted from a margin of safety based on common stock dividends reflects primarily the liberality or conservatism of corporate directorates or the self-restraint of the stockholders, and is only indirectly indicative of earnings.

Common stocks have therefore been related to a margin of equity, which may be defined as the percentage of net earnings which is available for common. Thus the common stock of the company having no senior securities would have a margin of 100, while the common stock of one barely earning fixed charges and preferred dividends would be zero. Chart 66-C depicts the yield line for common stock related to the margin of equity, prepared in the same fashion as those preceding it. Only stocks paying dividends out of current earnings are included. It is interesting to note that the yield at 100 per cent margin on this chart is substantially equal to that for bonds and preferred stocks at zero margin, which is in logical accord with the fact that bond or preferred stockholders whose margin of safety has vanished are taking essentially the same risk as common stockholders whose property is unencumbered. . . . The yield lines represent not the yields of any particular securities, but the typical yield of public utility securities as a class.

With this in mind it is obvious that if the margins for bonds, preferred stocks and common stocks of a typical utility be determined, one is enabled to read off from the charts at a glance the yields applicable to each. Such a determination has been made by computing the weighted average margin of all the bonds plotted and likewise of the preferred and common stocks. The result of the computation discloses a margin of 71.4 per cent for bonds, 40 per cent for preferred stocks and 68.5 for common stocks. Turning to the charts it will be seen that the corresponding yields are 5.73 per cent for bonds, 7.27 per cent for preferred stocks and 10.32 per cent for common stocks.

The remaining element in the problem is the determination of the relative proportions assumed in the capital structure of the industry, by bonds and by each class of stock. It is clear that analysis of a par structure would not give the answer, for it is the exception rather than the rule for securities to be sold at par, and it is the actual or market value which produces a specified total sum of capital. For several reasons it is difficult to determine a typical market value structure. The discount feature of bonds arising from and related to the maturity date presents one obstacle, but an even greater one is the fact that it is possible in comparatively few instances to secure satisfactory quotations on all of the outstanding securities of any given company.

There is, however, a direct and definite relationship between earnings charges and market values, and bond discount and coupon rates are all equated in the last analysis in the fixed charges. It therefore is possible to analyze the capital structure by determining the portion of net absorbed respectively by bonds, preferred stock and common stock. This has been done for all of the 137 companies whose securities are included in the plottings, with the result that the financial structure is found to be composed of 29.84 per cent bonds, 12.42 per cent preferred stocks and 57.74 common stocks.

Having now a definite financial structure and yields applicable to it, the weighting into a composite yield for all utility capital is accomplished in the following manner. If the bonds yield 5.73 per cent and absorb 29.84 per cent of net earnings for payment of their fixed charges, a simple division of the latter figure by the former makes it apparent that each $521 par value of bonds will demand $29.84 of the net. Similar computations for the preferred and common stocks are necessary and the summary of all three appears as follows:

$ 521 of bonds	at 5.73%	absorbs	$ 29.84 of net
171 of preferred stock	at 7.27%	absorbs	12.42 of net
560 of common stock	at 10.32%	absorbs	57.74 of net
$1252 of capital		absorbs	$100.00 of net

The weighted average composite rate of return or yield for the entire capital is now readily determinable by dividing $100 by $1,252 and is thereby found to be 7.99 per cent. The par structure may be expressed in percentages as follows:

	PER CENT
$521 of bonds is equivalent to	41
171 of preferred stocks is equivalent to	14
560 of common stocks is equivalent to	45
	100

It is of interest to observe that the composite rate of return varies but little, even though the financial structure contains a substantially larger or smaller proportion of bonds or of preferred stock, for of course in such a case the margins and yields also vary in sympathy. This has been pointed out by other writers, and is now susceptible of definite proof by the above method. The composite rate has been computed for several existing structures and found to confirm the foregoing assertions.

The criterion deduced is a criterion of actual fact, for it rests wholly on published records of the yields secured by investors in public utility securities throughout the land. It is in fact a determination of the market price of the commodity money, and while it confirms the conclusions heretofore rather generally reached by courts and commissions, it goes much further because it affords a means of analyzing what has in the past been largely a matter of unsupported judgment or opinion. . . . The actual market rental rates of money are, when adequately analyzed and properly related and combined into a composite whole, the only logical and incontrovertible proof of the rate of fair return

154. Customer Stock-Selling Costs Vary *

That the cost of selling stock to customers ranged from $2.66 to $8.94 per share in the case of a representative group of companies is one of the interesting facts disclosed by the report made by the customer-ownership committee at the twentieth annual convention of the Pennsylvania Electric Association. The investigation covered a large number of operating companies, six of which are typical and are used to illustrate various phases of customer-ownership activity.

Naturally the cost of selling stock varies widely with different companies and in different sections. One of the companies studied has been selling shares to its customers for more than seven years. In 1926 this company sold one-third of the total number of shares outstanding in the territory served. This shows the effect of repeat orders and that a saturation point is only temporary. The accompanying table shows the distribution of costs for six companies.

Rehandling of stock which has been returned is also discussed, with costs in specific cases. The cost of handling reacquired shares varies, according to the report, from 37 cents to $2.11 per share. The number of reacquired shares varies with the amount of personal attention given by the head of the investment or customer-ownership department, the general manager or divisional managers. An interview by those in authority with the customers offering their shares for sale and a little ingenious planning for the customer's interest will frequently persuade them to hold their shares. The committee finds it is more than a coincidence that a majority of the cities and towns which have a saturation below the average have a relatively high average "dollars of stock per holder." "Further," it reports, "we know of no better way to study public relations than to carefully go over the list

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* Editorial Summary of Report, Analyzing Costs of Selling Direct to Customers, *Electrical World* (Sept. 24, 1927), 638.

of shareholders in various cities and towns, weigh the factors of bad industrial conditions, character of population and so forth, and then balance accounts. We do not mean by this that a low customer-ownership saturation is a sure sign of poor public relations or vice versa, but we do say that it is a danger signal and a place where customer-ownership should receive special attention."

TABLE 73

Selling Costs per Share for Six Companies

(Includes all known expense. Selling ranges from $75 to $103 per share.)

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Employee commissions	$1.48	$1.85	$1.43	$1.87	$2.24	$1.72
Outside salesmen and general expense	0.81	2.15	3.05	2.02	1.75	3.18
Advertising	0.21	0.44	2.26	2.24	1.54	2.29
Prizes and banquets	0.05	0.07	0.11	0.44	0.21	0.25
Traveling and personal expenses.	0.02	0.30	1.69	0.54	0.39	1.17
Miscellaneous	0.09	0.40	0.23	0.70	0.61	0.33
Total cost per share sold......	$2.66	$5.21	$8.77	$7.81	$6.74	$8.94

155. The Yield to Investors in New Public Utility Financing *

The cost of money to a public utility corporation is an important element in the cost of the service. The experience of the public utility industry in this respect during the last eight years and the present trends can be followed by studying the average price which the investor receives for money lent to public utilities corporations.

A distinction must be made between the price which the investor receives—the interest yield at the price he paid computed to maturity—and the price paid by the utility corporation. The differential between yield to investor and corporation cost is made up principally of banker's discount, legal expenses, and miscellaneous charges such as for printing and engraving. No attempt is made in this analysis to determine the amount by which the price paid by the corporation exceeds the yield to the investor at offering price. The average yield of all new public

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* Adapted from H. B. Dorau, "Public Utility Financing," *Journal of Land and Public Utility Economics*, I (1925), 314-321, and quarterly figures in succeeding volumes.

utility interest-bearing security issues at the offering price is used to indicate the trend. The true cost to the utility would be some amount above this. The amount of this discount and expense varies with the company, the character of the security and market conditions. On the average it probably remains relatively constant except during such periods of rapidly rising yields as in 1919 and 1920, when larger discounts were demanded to cover the increased risk. . . .

The average yield at offering price reached its highest point during the fourth quarter of 1920. Beginning in the third quarter of 1919 there was an uninterrupted rise from a simple average yield of 6.58 per cent on all maturities and classes of interest-bearing securities to 7.94 per cent in the last quarter of 1920. From the first quarter of 1921 through two years to the end of 1922 there was a similarly precipitous and uninterrupted decline from the high of 7.94 per cent to a low of 5.99 per cent. During the first three quarters of 1923 the average yield rose .5 per cent, probably influenced by a greatly increased volume of financing and also by the fact that the lower rates encouraged borrowing by corporations which were unable or unwilling to borrow at the higher rates. Since the last quarter of 1923 through 1927, the decline in average yields has been marked but irregular, falling finally to a low average of 5.46 per cent in the fourth quarter of 1927 to make an average for the entire year of 5.57 per cent. Both a simple and a weighted average yield are presented so that one may be used as a check on the other. The simple average yield is an average per security issue, while the weighted average yield is an average yield per dollar. In a period when a large number of small issues (and these are rather generally at higher yields) constitutes but a small portion of the total par value of securities issued, the simple average yield gives too much importance to these small issues. Again, however, when some one issue is exceptionally large, the average yield per dollar of securities issued gives the large issues undue importance. It will be noted that the simple average yield (Table 74) is consistently above the weighted average yield, indicating that on the average the larger issues were sold at a lower yield to the investor.

An average taken as representative of the level at which public utility financing occurred may be somewhat misleading. It may happen that a large volume of financing was at rates very much higher than the average and another large volume at materially lower rates, leaving very little at the average rate. The

TABLE 74

WEIGHTED AND SIMPLE AVERAGE YIELD AT OFFERING PRICE OF NEW PUBLIC UTILITY SECURITY ISSUES

YEAR	ALL TYPES OF DEBT OBLIGATIONS						BONDS AND NOTES ONLY	
	All Maturities		*Long Term*		*Short Term*			
	Weighted Average Yield	Simple Average Yield	Weighted Average Yield	Simple Average Yield	Weighted Average Yield	Simple Average Yield	Weighted Average Yield	Simple Average Yield
1919	6.55	6.68	6.21	6.25	6.78	7.03	6.54	6.67
1920	7.55	7.64	7.52	7.59	7.59	7.68	7.53	7.62
1921	7.13	7.47	7.11	7.42	7.27	7.66	7.11	7.45
1922	6.06	6.34	6.03	6.32	6.39	6.53	6.03	6.34
1923	6.04	6.31	5.99	6.26	6.73	6.72	6.11	6.29
1924	6.03	6.14	6.04	6.16	5.97	6.04	5.98	6.12
1925	5.58	5.81	5.66	5.83	5.55	5.86	5.56	5.78
1926	5.53	5.72	5.52	5.70	5.77	5.82	5.44	5.66
1927	5.24	5.61	5.25	5.57	5.11	5.77	5.12	5.57

TABLE 75

Quartile Distribution of Public Utility Securities.—Summary

1919–1927 *

	1919	1920	1921	1922	1923	1924	1925	1926	1927
1st Quartile									
Range	5.30–6.16	5.88–7.10	5.50–6.25	4.70–5.50	4.65–5.62	4.70–5.60	4.30–5.30	4.50–5.10	4.15–4.85
Simple Average Yield......	5.82	6.72	6.07	5.26	5.31	5.33	5.03	4.99	4.64
Weighted Average Yield....	5.87	6.84	6.14	5.34	5.38	5.27	5.02	4.97	4.68
2nd Quartile									
Range	6.16–6.30	7.10–7.60	6.25–7.30	5.50–6.05	5.62–6.10	5.60–6.00	5.30–5.50	5.10–5.40	4.85–5.11
Simple Average Yield......	6.22	7.38	6.98	5.83	5.91	5.85	5.44	5.26	5.01
Weighted Average Yield....	6.21	7.39	6.97	5.78	5.83	5.79	5.36	5.23	5.02
3rd Quartile									
Range	6.30–7.00	7.60–8.00	7.30–7.65	6.05–6.50	6.10–6.38	6.00–6.40	5.50–6.00	5.40–6.00	5.11–5.53
Simple Average Yield......	6.73	7.84	7.46	6.28	6.23	6.21	5.76	5.70	5.30
Weighted Average Yield....	6.81	7.79	7.41	6.25	6.19	6.21	5.66	5.68	5.24
4th Quartile									
Range	7.00–8.00	8.00–9.32	7.65–9.00	6.50–8.00	6.38–7.50	6.40–8.00	6.00–7.06	6.00–7.50	5.53–7.40
Simple Average Yield......	7.35	8.18	8.09	7.03	6.76	6.77	6.31	6.27	6.12
Weighted Average Yield....	7.29	8.20	8.03	6.86	6.75	6.86	6.31	6.25	6.03
Total									
Range	5.30–8.00	5.88–9.32	5.50–9.00	4.70–8.00	4.65–7.50	4.70–8.00	4.30–7.06	4.50–7.50	4.15–7.40
Simple Average Yield......	6.68	7.64	7.47	6.34	6.31	6.14	5.81	5.72	5.61
Weighted Average Yield....	6.55	7.55	7.13	6.06	6.04	6.03	5.58	5.53	5.24

* Compiled from the records of the *Commercial and Financial Chronicle.*

average as computed is not necessarily typical of the rate at which any large volume of securities was issued.

A quartile distribution of the volume of new public utility security issues on the basis of yields is presented in Table 75 for the entire period 1919-1927. Issues falling below the first (lowest) quartile range[1] in 1927 were offered to yield only 4.68 per cent on the dollar; those falling between the first quartile and the median 5.02 per cent; between the median and the third quartile, 5.24 per cent; and those at yields higher than the third quartile point, 6.03 per cent. Thus half the new public utility financing during 1927 was at an average rate of 4.85 per cent while the average for all was 5.24 per cent. That half of new financing whose yield was above that of the median issue was offered to yield an average of 5.64 per cent. It will be further noted from Table 75 that the quartile range of those issues falling between the first quartile and the median was only 4.85 per cent to 5.11 per cent or .26 per cent. In 1926, the figure was .30 per cent.

156. Changing Cost of Railway Capital *

The changing cost of railway capital as a determinable element in the cost of railway service, has been given less thought in rate-making than its importance deserves.

When it is realized that the "wages of capital" take a very important and significant part of every dollar of revenue—because of the large fixed investment and the slow capital turnover—it is evident that the cost of capital should be a matter for exact thought in determining the "fair rate of return" which the railroads are to be allowed to earn on their investment, under regulation. Instead, attention has regularly been diverted from the rate of return to the rate-base as premised by the "fair value" doctrine in the Transportation Act. It is only too obvious that the real matter of concern alike to the railroad management and to the investor is not the rate-base nor even the rate of return but the return itself, and that both base and rate are indispensable requisites for the determination of the return. . . .

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[1] "Quartile range" is a term here used to indicate the items falling between the several quartile points. Thus, first quartile range indicates those items falling below the first quartile point; the second quartile range refers to the items between the first quartile point and the median; the third quartile range to those between the median and third quartile point; and the fourth quartile range to the items above the third quartile point.

* Adapted from H. B. Dorau: "The Cost of Railway Capital under the Transportation Act of 1920," *Journal of Land and Public Utility Economics*, III (1927), 1-20; 219-221; 427-430; and IV (1928), 206-208.

Several meanings are attached to the phrase "cost of capital" depending usually upon which element in the total cost is being emphasized. In a very restricted sense, the term "cost of capital" may be understood to mean merely the cost of hiring capital. Included in this are principally (1) the difference between the price received by the company for the securities and the price at which the investment banker offers them to the investor; and (2) the expense incidental to the financing absorbed directly by the company. The first of these elements in the cost of hiring capital is accurately available for the financing of steam railways since May 1920, and is by far the more important element. The costs incidental to financing which are absorbed directly by the company are relatively unimportant in most instances and, moreover, are not accurately known or ascertainable in their entirety. But, in a broader definition, the cost of hiring capital is only one part of the cost of capital. There remains the compensation for the use of capital, which is recognized in the form of current interest payments plus the proper deduction for that part of the discount which is postponed interest or minus the proper credits on account of premium received. *The total cost of capital is the cost of the total of the cost of hiring plus the return in the form of current interest and amortization of discount.*

The latter, expressed as a net yield to investors, is by far the more important of these two main elements in the cost of money, although the cost of hiring is of such significance that it cannot be disregarded.

This average net yield at market price (offering price to investors) on new railway security issues is set forth by classes of securities for the years 1919-1927 in Table 76, in which the simple average yield is the yield per issue or yield on par; and the weighted average yield is the yield per dollar, which takes account of the premium or discount charged on the issue. It shows that issues in the bad year 1920 had to be sold to yield the investor an average of almost 7 per cent (6.94 per cent to be exact), and this was true for all types of securities,—bonds, notes, debentures, and equipment trust certificates. The average yield per dollar of all security issues was lower than the average yield per issue in every year except 1919, 1921, and 1925, although in the last-mentioned year the figures are substantially the same. In periods when interest rates were not changing

TABLE 76

WEIGHTED AND SIMPLE AVERAGE YIELD AT OFFERING PRICE OF NEW STEAM RAILWAY SECURITY ISSUES BY TYPES OF SECURITIES, 1919–1927 *

YEAR	ALL SECURITIES		BONDS		NOTES		DEBENTURES		CERTIFICATES	
	Yield per Dollar	Yield per Issue	Yield per Dollar	Yield per Issue	Yield per Dollar	Yield per Issue	Yield per Dollar	Yield per Issue	Yield per Dollar	Yield per Issue
1919	6.10	5.91	6.10	5.91	6.26	6.20	...	...	5.67	5.68
1920	6.93	6.94	6.92	6.80	5.93	7.07	7.00	7.00	6.92	6.93
1921	6.42	6.05	6.61	6.06	7.60	7.50	6.14	6.14	6.06	6.01
1922	5.58	5.63	5.72	5.82	5.24	5.34	...	...	5.42	5.58
1923	5.37	5.51	5.39	5.52	5.75	5.62	5.13	5.68	5.34	5.48
1924	5.18	5.24	5.39	5.49	5.12	5.34	4.94	4.94	4.89	5.03
1925	5.25	5.24	5.38	5.51	5.33	5.58	...	...	4.87	4.85
1926	4.95	5.04	5.08	5.29	5.16	5.05	...	...	4.65	4.71
1927	4.88	4.85	4.92	5.03	...	...	...	...	4.43	4.40

* Compiled from the *Commercial and Financial Chronicle.*

rapidly, one finds very little difference between the average yields per dollar and per issue.

The Cost of Hiring. The other main element in the cost of capital namely, the cost of hiring (*i.e.* financing) is measured by the difference between the price received by the company and the price paid by the investor. The necessary data can be gathered from the returns of the railroad companies to the Interstate Commerce Commission. Under authority of the Act of 1920, the Interstate Commerce Commission requires from the company a return showing the amount of securities sold and the price or value of goods or services received. In order to determine the amount of the differential between the price to the company and the price to the investor, all issues for cash not privately placed and in excess of $100,000 have been studied and arranged according to the character of security issued. Such comparison of price to the company and of the price to the investor in the period 1920-1927 is given for bonds in Table 77, for equipment trust certificates in Table 78, and for miscellaneous securities in Table 79.

This "spread" representing the cost of hiring capital may be expressed in several ways of varying accuracy. Referring to Table 77, there is listed in column (M) the par value of securities

TABLE

COMPARISON OF PRICE TO COMPANY AND COST TO INVESTOR AT

Year	(M) Par Value Sold[c]	No. of Issues	Price Received by Company		Value at Offering Price to Investor	
			(N) Total Dollars	(O) Per Hundred	(X) Total Dollars	(Y) Per Hundred
1920[b]	$25,000,000	1	24,132,500.00	96.53	25,000,000.00	100.0
1921	342,104,000	10	316,616,563.90	92.55	332,162,458.00	97.09
1922	304,487,800	26	282,000,650.50	92.61	292,801,196.50	96.16
1923	155,841,000	19	146,345,429.10	93.91	150,473,180.00	96.56
1924	431,252,000	41	405,102,536.80	93.94	418,745,865.00	97.10
1925	321,395,500[a]	29	303,512,106.30	94.44	312,318,942.50	97.18
1926	205,148,000	27	194,260,186.10	94.69	199,640,482.70	97.31
1927	499,930,500	32	469,917,464.86	94.00	482,933,015.00	96.60

[a] To obtain a more homogeneous group, the issues sold at a loss were elimi-
"Difference in Yield" ratio was computed upon all issues. The yield per dollar
ratios.

[b] Beginning with May, 1920, date of first applications under the Esch-

[c] All issues over $100,000 par value, for which both price to the company and

sold; in column (N) the price in dollars received by the company from the bankers. The ratio of the price received by the company to the par value is set forth in column (O) as points or dollars per $100 of par value received. In column (X) is recorded the value in dollars at offering price to the investor, and in column (Y) the points or dollars per $100 of par value paid by the investor.

1. The crudest and most elementary way of expressing the fact that a discount on securities has been taken is to compare the price received by the company with the par value. Thus, the sale at 92 of a security with a par value of 100 was at a discount of 8 points on the hundred. This is such an obvious confusion of postponed discount and cost of financing that it can be dismissed without further consideration.

2. Equally confusing and meaningless is the calculation of the ratio $\frac{(Z)}{M}$ of the dollars difference between price to the company and the investor to the par value, or the points difference between the price per hundred dollars received by the company and par (100).

3. Another method is to subtract the average price per $100 received by the company (O) from the average price per $100 paid by the investor (Y), which gives the average

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OFFERING PRICE OF BONDS ISSUED BY STEAM RAILWAYS, 1920[b]–1927

DIFFERENCE IN PRICE TO COMPANY				PER CENT YIELD AT PRICE TO COMPANY		PER CENT YIELD AT PRICE TO INVESTOR		DIFFERENCE IN YIELD	
(M−N)=Z Total Dollars	Y−O	$\frac{Z}{X}$	$\frac{Z}{N}$	Per Issue	Per Dollar	Per Issue	Per Dollar	Per Issue	Per Dollar
867,500.00	3.47	3.470	3.594	7.50	7.50	7.00	7.00	.50	.50
15,545,894.00	4.54	4.68	4.910	6.63	7.25	6.34	6.75	.29	.50
10,800,546.00	3.55	3.689	3.830	6.13	5.94	5.87	5.68	.26	.26
4,127,750.90	2.65	2.743	2.821	5.85	5.53	5.69	5.37	.16	.16
13,643,328.20	3.16	3.258	3.368	5.69	5.61	5.44	5.38	.25	.23
8,806,836.20	2.74	2.819	2.901	5.67	5.65	5.45	5.44	.22	.21
5,380,296.60	2.62	2.69	2.77	5.52	5.29	5.34	5.11	.18	.18
13,015,551.14	2.60	2.70	2.77	5.32	5.10	5.07	4.94	.25	.16

nated from the par value total upon which these ratios were computed, but the is little affected by the inclusion of all par values in the *Difference in Yield*

Cummins Act.
to the investor was available, were used.

TABLE

COMPARISON OF PRICE TO COMPANY AND COST TO INVESTOR AT OFFERING

1920[a]

YEAR	(M) PAR VALUE SOLD[b]	NO. OF ISSUES	PRICE RECEIVED BY COMPANY		VALUE OF OFFERING PRICE TO INVESTOR	
			(N) Total Dollars	(O) Per Hundred	(X) Total Dollars	(Y) Per Hundred
1920	$15,007,000	3	14,476,535.20	96.47	15,074,507.50	100.45
1921	26,239,600	9	25,625,518.40	97.66	26,267,029.90	100.10
1922	93,409,000	21	90,167,094.50	96.53	92,224,817.50	98.73
1923	273,198,000	44	262,554,659.00	96.10	269,516,897.60	98.65
1924	206,668,000	33	201,327,916.00	97.42	205,178,230.80	99.28
1925	110,216,000	24	107,296,582.60	97.35	109,222,116.60	99.10
1926	95,433,000	18	92,752,392.90	97.19	94,163,659.70	98.67
1927	60,097,000	18	59,750,002.28	99.42	60,145,141.38	100.08

[a] Beginning May, 1920, date of first applications under the Esch-Cummins Act.

[b] All issues over $100,000 par value, for which both price to the company and

dollars per hundred difference (Y—O) received by the bankers in compensation for their services. This method does not involve the error of including possible elements of postponed interest, but it gives no weight to the amount of capital actually secured by the company so that the cost of financing would appear the same whether a bond was sold for 93 and brought the company 90, or was sold for 78 and brought the company 75, yet the *cost* in the latter case would be materially higher.

The average difference between the price per $100 received by the company and the price per $100 paid by the investor on bonds issued by railway companies during the period under review (1920-1927) was 3.16 (see Table 81). For equipment trust certificates, the figure was 2.03; and for miscellaneous securities, 1.69 (Table 81).

4. Again, the cost of financing may be expressed as the percentage relationship of the amount of difference between dollars received by the company and paid by the investor, to the value at the offering price.

Thus, $\frac{Z}{X}$ is the ratio of the banker's share to the value of the issue or issues at the price at which the investor absorbed them. For the period under review (1920-1927), steam railway bonds were sold by bankers at a cost $\frac{Z}{X}$, which on the average

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PRICE OF EQUIPMENT TRUST CERTIFICATES ISSUED BY STEAM RAILWAYS, –1927

DIFFERENCE IN PRICE TO COMPANY				PER CENT YIELD AT PRICE TO COMPANY		PER CENT YIELD AT PRICE TO INVESTOR		DIFFERENCE IN YIELD	
(M—N)=Z Total Dollars	Y—O	$\frac{Z}{X}$	$\frac{Z}{N}$	Per Issue	Per Dollar	Per Issue	Per Dollar	Per Issue	Per Dollar
597,972.30	3.98	3.967	4.131	7.25	7.30	6.76	6.74	.49	.56
641,511.50	2.44	2.442	2.503	6.79	6.74	6.69	6.66	.10	.08
2,057,723.00	2.28	2.30	2.35	5.73	5.67	5.39	5.33	.34	.34
6,962,238.00	2.55	2.583	2.652	5.84	5.74	5.43	5.34	.41	.40
3,850,314.80	1.86	1.877	1.912	5.47	5.27	5.02	4.94	.45	.33
1,925,534.00	1.75	1.763	1.795	5.16	5.11	4.86	4.80	.30	.31
1,411,266.80	1.48	1.50	1.52	4.96	4.95	4.73	4.71	.23	.24
395,139.10	.66	.66	.66	4.61	4.59	4.49	4.49	.12	.10

to the investor was available, were used.

for all available issues, represented 3.26 per cent of the price paid by the investor (Table 81).

A similar figure for equipment trust certificates is 2.05 per cent and for miscellaneous securities is 1.71 per cent.

This method shows the investor the relationship of the cost of marketing capital to his outlay, but has no significance as a measure of the cost of financing to the issuing company.

5. Still another method of measurement is the percentage relationship $\frac{Z}{N}$ of the difference in price (dollars) to company and investor, to the actual dollars received by the company for its securities. This ratio $\frac{Z}{N}$ was found to average 3.37 per cent for bonds issued in the period 1920-1927; and 2.09 per cent for equipment transfer certificates; and 1.74 per cent for miscellaneous securities (Table 81). But this method takes no account of the frequency of financing—or length of time for which capital is hired—which also is a factor in cost of financing.

6. To include this time factor, we have taken, as our final method of measuring and expressing the cost of financing, the computation of the interest yield per dollar to maturity at the price received by the company, and again in the same manner at the price paid by the investor. Thus, the average interest yield for all bond issues during 1922 was 5.94 per cent per dollar, and

TABLE

Comparison of Price to Company and Cost to Investor at Offering

1920–

Year	(M) Par Value Sold[b]	No. of Issues	Price Received by Company		Value of Offering Price to Investor	
			(N) Total Dollars	(O) Per Hundred	(X) Total Dollars	(Y) Per Hundred
1920	....	..	....	....	....	....
1921	$2,000,000	1	1,875,200	93.76	1,928,800	96.44
1922	....	..	....	....	....	....
1923	19,600,000	4	19,163,000	97.77	19,459,000	99.28
1924	48,350,000	9	47,307,500	97.84	48,131,695	99.55
1925	1,000,000	1	942,500,000	94.25	990,000	99.00
1926	6,000,000	1	5,899,200	98.32	5,959,200	99.32
1927	7,500,000	1	7,275,000	97.00	7,425,000	99.00

[a] Beginning May, 1920, date of first applications under the Esch-Cummins Act.
[b] All issues over $100,000 par value, for which both price to the company and

6.13 per cent per issue (Table 77). The average interest yield at price to the investor for this same year was per issue 5.87 per cent and per dollar 5.68 per cent. Subtracting the yield to maturity at price to the investor (5.87) from the yield to maturity

TABLE

Average Yield at Price to Company of All

Year	All Securities		Per Cent Yield at Price to Company		Bonds		
	Par Value Involved	No. of Issues	Per Issue	Per Dollar	Par Value	Av. Yield per Dollar at Price to Co.	No. of Issues
1920[a]	54,543,000.00	14	7.02	7.29	35,719,500.00	7.34	5
1921	418,494,009.00	60	6.83	7.21	350,944,400.00	7.23	30
1922	438,895,604.00	88	6.02	5.86	317,582,600.00	5.92	49
1923	541,815,631.00	109	5.90	5.61	223,895,300.00	5.38	38
1924	720,895,793.00	135	5.80	5.54	447,084,800.00	5.61	70
1925	520,187,740.00	157	5.46	5.45	356,721,844.75	5.63	85
1926	432,664,310.29	168	5.56	5.24	278,254,600.00	5.36	71
1927	678,594,790.12	165	5.51	5.13	562,630,500.00	5.16	78

[a] Beginning with May, 1920, date of first applications under the Esch-Cummins

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PRICE OF MISCELLANEOUS[a] SECURITIES ISSUED BY STEAM RAILWAYS, 1927

DIFFERENCE IN PRICE TO COMPANY				PER CENT YIELD AT PRICE TO COMPANY		PER CENT YIELD AT PRICE TO INVESTOR		DIFFERENCE IN YIELD	
(M—N)=Z Total Dollars	Y—O	$\frac{Z}{X}$	$\frac{Z}{N}$	Per Issue	Per Dollar	Per Issue	Per Dollar	Per Issue	Per Dollar
......	....	....	....	....	....	....	....	....	....
53,600	2.68	2.779	2.858	7.39	7.39	7.00	7.00	.39	.39
......	....	....	....	....	....	....	....	....	....
296,000	1.51	1.521	1.545	6.32	6.44	5.72	5.77	.60	.67
824,195	1.71	1.712	1.742	6.26	6.12	5.29	5.26	.97	.86
47,500	4.75	4.80	5.04	7.40	7.40	6.20	6.20	1.20	1.20
60,000	1.00	1.01	1.02	5.40	5.40	4.86	4.86	.54	.54
150,000	2.00	2.02	2.06	6.11	6.11	5.37	5.37	.74	.74

to the investor was available, were used.

at price to the company (6.13), we find the difference to be .26 per cent per issue, and the same per dollar for this year (1922). See Table 77.

By this method of measurement, the average cost of financing

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STEAM RAILWAY SECURITY ISSUES, 1920–1927

EQUIPMENT TRUST CERTIFICATES			MISCELLANEOUS		
Par Value Sold	Av. Yield per Dollar at Price to Co.	No. of Issues	Par Value Sold	Yield per Dollar at Price to Co.	No. of Issues
15,777,000	7.28	4	3,046,500.00	7.01	5
40,741,600	6.76	17	26,808,009.00	7.64	13
121,236,000	5.71	37	77,004.00	6.00	2
295,718,000	5.72	57	22,202,332.00	6.45	14
223,095,000	5.27	38	50,715,993.00	6.11	27
145,867,076	5.04	46	17,598,819.00	5.20	26
126,253,500	4.97	37	28,156,210.29	5.26	60
71,679,000	4.61	24	44,285,290.12	5.68	63

Act.

TABLE 81

SUMMARY OF COST OF FINANCING EXPRESSED IN VARIOUS WAYS, BY YEARS AND FOR THE PERIOD 1920*–1927

YEAR	ALL CLASSES[a]				BONDS				EQUIPMENT TRUST CERTIFICATES				MISCELLANEOUS			
	Y—O[b]	$\frac{Z}{X}$[c]	$\frac{Z}{N}$[d]	Yield Difference[e]	Y—O	$\frac{Z}{X}$	$\frac{Z}{N}$	Yield Difference	Y—O	$\frac{Z}{X}$	$\frac{Z}{N}$	Yield Difference	Y—O	$\frac{Z}{X}$	$\frac{Z}{N}$	Yield Difference
1920	3.66	3.66	3.80	.52	3.47	3.47	3.59	.50	3.98	3.97	4.13	.56	...	...	...	...
1921	4.38	4.51	4.72	.47	4.54	4.68	4.91	.50	2.44	2.44	2.50	.08	2.68	2.78	2.86	.39
1922	3.25	3.36	3.48	.29	3.55	3.69	3.83	.26	2.28	2.30	2.35	.35	...	...	...	...
1923	2.54	2.59	2.66	.32	2.65	2.74	2.82	.16	2.55	2.58	2.65	.38	1.51	1.52	1.55	.67
1924	2.67	2.73	2.80	.24	3.16	3.26	3.37	.23	1.86	1.88	1.91	.08	1.71	1.71	1.74	.86
1925	2.49	2.55	2.62	.24	2.74	2.82	2.90	.23	1.75	1.76	1.79	.31	4.75	4.80	5.04	1.20
1926	2.23	2.28	2.34	.20	2.62	2.69	2.77	.18	1.48	1.50	1.52	.24	1.00	1.01	1.02	.54
1927	2.39	2.46	2.53	.16	2.60	2.70	2.77	.16	.66	.66	.66	.10	2.00	2.02	2.06	.74
1920–1927	2.82	2.89	2.97	.27	3.16	3.26	3.37	.25	2.03	2.05	2.09	.26	1.69	1.71	1.74	.78

[a] On the per dollar basis throughout.

[b] Y-O is the difference between average price received by the company and the average price per hundred paid by the investor.

[c] $\frac{Z}{X}$ Ratio of the banker's share to the value of the issue or issues at the price at which the investor absorbed them.

[d] $\frac{Z}{N}$ Ratio of the banker's share to the actual dollars received by the company.

[e] Yield difference—difference between yield per dollar to maturity at price to the company and at price paid by the investor.

* From May, 1920, through December, 1927.

by bonds for the period since the passage of the Transportation Act was .25 per cent per dollar (Tables 77 and 81). Thus .25 per cent per dollar per year was the cost of hiring the average dollar in the years 1920 to 1927 through issuance of bonds.

Using this method in the case of the issuance of equipment trust certificates, the cost of hiring for the period is .26 per cent. per dollar per year (Tables 78 and 81). The results of applying all other methods of measuring the cost of financing show that the cost of equipment trust certificates was lower than for bonds. If the cost is expressed as so much more interest over the period to maturity, which period is on the average shorter for trust certificates than for bonds, the cost of hiring capital on that basis is .01 per cent per year higher than on bonds.

Miscellaneous securities, which always held the lowest position when any other method was applied, now are the highest because of the corrective effect of taking into account the period for which capital is hired. The average cost of miscellaneous securities was .78 per cent per dollar (Tables 79 and 81). . . .

Table 76 gave the cost of capital at the offering or market price, as compiled by *Commercial and Financial Chronicle*. But the market selling price was not available for a considerable number of issues of all classes. They were privately placed; thus, all the information that is available on these issues is the price the company received and thus the yield at the price to the company, but not the yield at the price to the investor. Tables 77, 78 and 79 report the facts for the more limited number of issues for which both prices are available. Table 80 presents the facts as to the average yield at the price to the company, namely, the total cost of capital in terms of interest per dollar per year, as compiled from the Interstate Commerce Commission data. Here, with a few exceptions all issues in excess of $100,000 par value are used. The results are similar to those secured with the limited sample, but slightly higher yields obtain on the average. The total cost per dollar per year for all classes of securities was 5.13 per cent; for bonds only was 5.16 per cent; for equipment trust certificates, 4.61 per cent; and for miscellaneous securities was 5.61 per cent (Table 80).

In Table 81 there is presented a summary of the more important ratios and percentage financing costs for the period as a whole by classes of securities.

The data in the several tables of this study afford the means of comparison with the rate at which capital has been

TABLE 82

Comparison of Total Cost of Capital with Ratio of Operating Income to Investment, and of Net Income to Stock, of Operating Steam Railway Companies

(All securities on which price to the company is available)

Year	Cost of Capital Secured by Issuance of				Return on Investment	Earned on Stock
	All Securities	Bonds	Equipment Trust Certificates	Miscellaneous Securities		
1920	7.29	7.34	7.28	7.01	.06	5.45
1921	7.21	7.23	6.76	7.64	2.96	3.94
1922	5.86	5.92	5.71	6.00	3.74	4.85
1923	5.61	5.38	5.72	6.45	4.56	6.95
1924	5.54	5.61	5.27	6.11	4.44	6.70
1925	5.45	5.63	5.04	5.20	4.89	8.19
1926	5.24	5.36	4.97	5.26	5.15	9.43
1927	5.06	5.16	4.61	5.68	4.41	7.78
1920 1927	5.67	5.74	5.43	6.06	3.86	...

compensated during the same period under the operation of the Transportation Act of 1920.

The annual reports of the Interstate Commerce Commission give the return on investment and the net income to stock of the operating steam railways excluding switching and terminal companies, for the years 1920-27 (See Table 82). If the true value of the railways proves to be anywhere near, if not exceeding, the investment figure of the companies, it would seem that the rate of return for the industry as a whole is below that necessarily paid as the total average price of new borrowed capital. In the 7-year period the average return on the average dollar of capital in the steam railway industry was 3.78 per cent and the average total cost of newly borrowed capital per dollar per year on all classes of securities was 5.67 per cent, and on bonds, 5.74 per cent. In these last two figures the cost of hiring capital accounted for .27 per cent per dollar per year for all classes of new securities (Table 81), and .25 per cent per dollar per year for bonds.

The significance of such computations of the cost of different forms of financing becomes more apparent when the emphasis in rate regulation is shifted from the rate-base to the rate of return. An essential factor in determining the rates of return necessary to attract and hold capital in the industry is the relative cost of different ways of getting necessary capital. And such information is needed, too, if it is desired to establish differential rates of return as inducements to economy in financing. The method here used, which may be called the ''interest yield to maturity method'' seems to serve best the purposes of such investigation.

CHAPTER XV

THE REVENUE OF PUBLIC SERVICE INDUSTRIES

157. Influence of Business Cycles on Utility Operations *

. . . The financial problems, the operating problems, regulation, engineering, and public relations problems have been such as to distinguish the utilities from other businesses. Until recently, engineering problems, because of their significance and pressing nature, have tended to obscure other phases of utility management, with the result that an inadequate amount of rigorous study has been devoted to these other aspects. This has been particularly true of the economic problems in public utility management; too little intensive investigation and careful study of them have been made.

It has long been recognized, for example, that the electric light and power business has enjoyed comparatively greater financial stability and soundness from year to year than has the general run of industrial concerns. . . . One reason for this greater stability has been the daily necessity of electric service; another reason has been the natural and regular increase in the business, which has been due to the fact that the market has not yet become saturated. Careful study of the recent growth of the electric light and power industry, however, tends to indicate that an element of resiliency has been introduced and that the stability which has characterized it in the past may be somewhat modified.

During the last five or six years, a great percentage of the growth of this industry has resulted from the development of industrial power. Although this development has made for economy in operation by evening the load, it introduces the uncertain problems of the business cycle and undoubtedly will cause the industry to become increasingly subject to the fluctuations in general business.

One of the problems, therefore, which is especially in need of detailed and scientific analysis is the effect of the business cycle on this utility, particularly upon its operations. The financial

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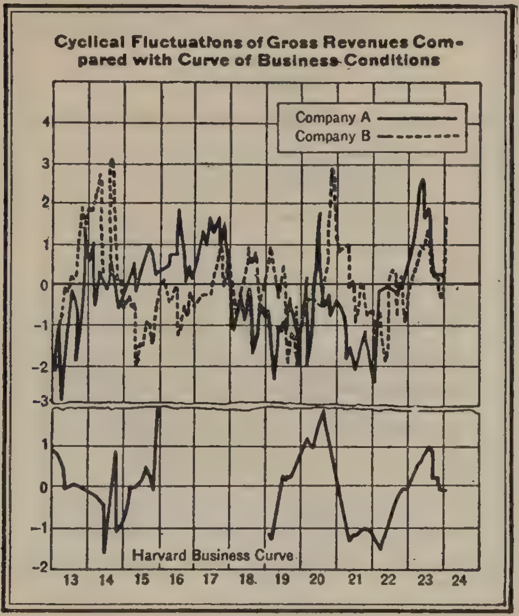
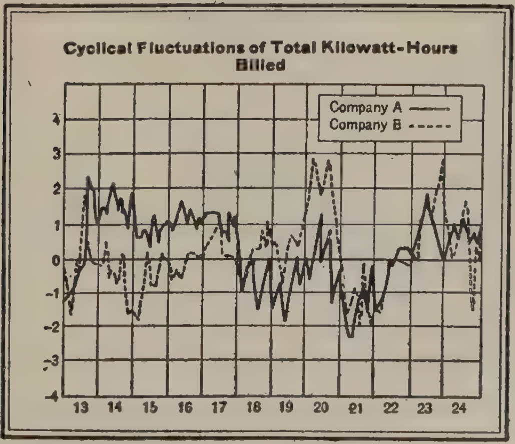
* By A. E. Patton and O. Gressens, *Journal of Land and Public Utility Economics*, II (1926), 40–47.

Chart 67



structures of many public utilities indicate that in practice the principle is accepted that alternating periods of prosperity and depression are less telling in their inroads into the revenues of

Chart 68



public utilities than they are into the sales of ordinary industrial enterprises. The survival of these companies, many of which have been trading on thin equities, from severe depressions indicates the general soundness of this principle. A new problem, however, has been introduced by the development of industrial power as a result of which more systematic study

Chart 69

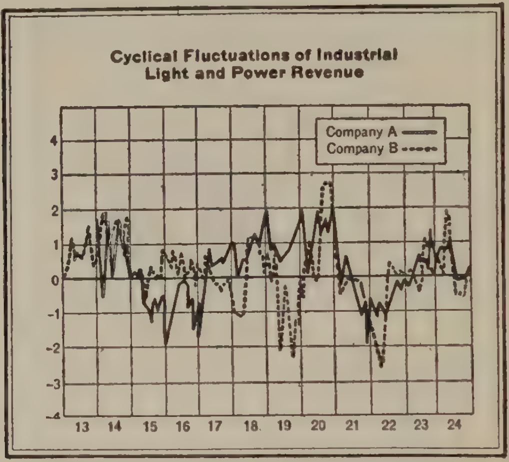


Chart 70

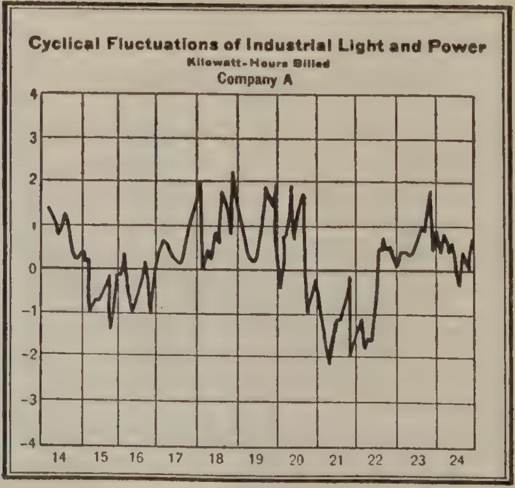


Chart 71

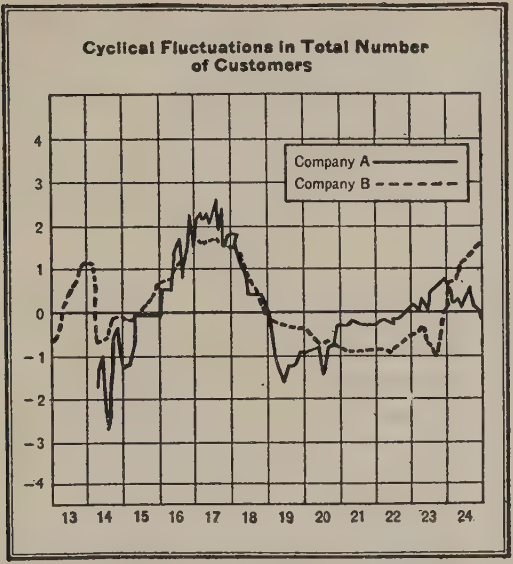
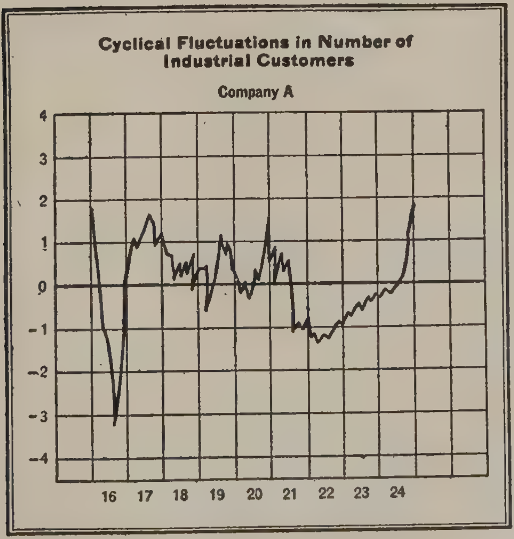


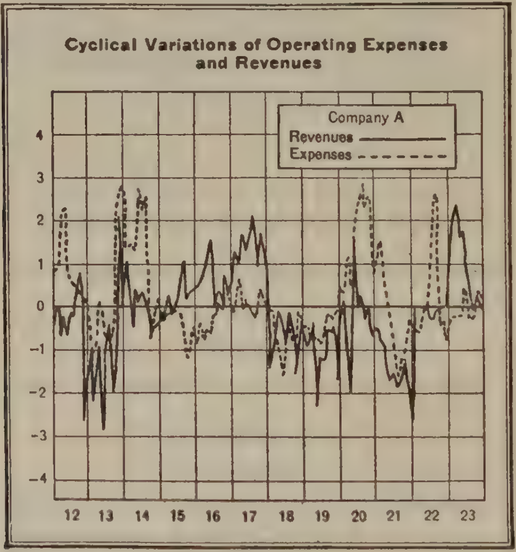
Chart 72



will become imperative to the efficient conduct of the business.

In studying the effects of changing business conditions upon the electric light and power industry, several important considerations must be kept in mind. Such considerations may be considered as presuppositions (which are to be substantiated by statistical evidence presented later). In the first place, revenues of these utilities do not react to changing prices as readily as do the sales of industrials. In contrast with other businesses, utilities are generally operated as monopolies and their rates are regulated. The effects of the business cycle on revenues, therefore, in so far as these effects are transmitted through price changes, are not direct. Second, the prevalent practice of adjusting rates for industrial power in accordance with the quantity consumed adds another difficulty because of the fact that the revenues of these utilities do not vary in direct proportion to the physical output. As an industry using electric power begins to feel a depression, it reduces the demand for service; and if the reduction in demand is great enough, it will be obliged to pay higher unit rates for a smaller amount of electric power. Under these circumstances, variations in the amount of revenues of a utility would not corre-

Chart 73



late directly with variations in physical output. Hence, even though the business cycle will eventually influence revenues, they do not furnish as satisfactory an index of the cyclical influences upon the business as do the data of the physical output.

In the case of cyclical movements, especially those which are chiefly monetary in their character, such as occurred in 1919 and 1920, revenues prove insufficient. On the other hand, physical output is not entirely satisfactory, for changes in monetary conditions are not directly reflected in them. These difficulties, however, do not render quantitative analysis useless. They necessitate that both the revenues and the physical output be studied together. For even though the comparatively rigid prices at which public utilities are forced to sell their services, irrespective of the changing economic conditions which are incident to the business cycle, do not immediately reflect price changes, nevertheless fluctuations in the demand on the part of consumers, which are caused by these changes, are reflected in the physical output and eventually in the revenues. In other words, increased use of power and light during periods of prosperity, and retrenchments during periods of depression, must necessarily be reflected in the output and finally in the revenues of these businesses.

To determine precisely the effects of cycles, however, the different classes of revenues should be differentiated and studied in isolation. This differentiation should also be observed in the study of the physical output.

Operating expenses, on the other hand, constitute a more elastic element in these utilities. They tend to follow more closely than do the revenues the price changes which are incident to the cycle. In a complete study of the effects of the business cycle on these utilities, therefore, these data must also be analyzed, and studied together with the revenues and physical output.

Lastly, a study of the growth in number of customers should be made to determine whether such variations as occur in this business are due chiefly to variations in the number of customers, or to changes in the per capita consumption of service.

The following study was made of these various data in the cases of two of the largest electric utilities in the United States. The curves which are presented are the cycle curves of these data.[1]

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[1] In each case the data have been corrected for secular trend and for seasonal variation. The cycle fluctuations, after having been expressed in terms of "per cent of normal," have been converted into units of standard deviation, in which form each series is comparable to any other series expressed in the same units. Fluctuations of the curves in the preceding

Chart 67 presents the cycle curves of the total revenues of these two companies. On the whole, these curves show a great deal of similarity in their movements, with the exception of the year 1915, when the movements were in opposite directions. On the other hand, the timing of the movements was not always the same. When these two curves are compared with a curve of the general business cycle,[2] it can be seen at first glance that previous to 1919 there was not a great deal of sympathetic movement between the general business cycle and the cycles of these two utilities. Begininng with 1919, however, the cycle curves of these two companies begin to follow the movements of the general business cycle with surprising closeness. This is perhaps explained by the great strides which have been made in the development of industrial power in these years. The effects of this development have been undoubtedly to make the utilities increasingly sensitive to the fluctuations of general business conditions. The boom of 1920, which was in reality due to a tremendous inflation and was, in fact, a movement caused by the monetary conditions which obtained after the war, is registered in the cycle curves of these two utilities by a sudden, though not sustained, increase in monthly revenues. The subsequent depression and recovery are again faithfully reflected. To what extent, however, does the business cycle cut into the revenues of these companies?

The standard deviations of these fluctuations for Company *A* and Company *B*, respectively, are 3.850 per cent and 4.057 per cent. In other words, the most frequent fluctuations from normal for each of these companies were 3.850 per cent and 4.057 per cent, respectively.[3] It is evident, therefore, that the business

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charts, therefore, represent fluctuations above and below normal of the particular data in question as a result of the business cycle.

[2] The general business curve used in this connection is the one prepared by the Harvard Economic Service.

[3] The standard deviation in this case has been calculated about the line of trend. It thus represents the standard error from normal. Attention must be called to the fact, however, that the exact significance of the standard deviation in the case of a normal distribution in the theory of probability is not applicable here. The distribution of the monthly fluctuations about the line of trend would have to be normal if this precise interpretation were to be placed on the standard deviation. Even if this were the case, however, it is questionable whether the definite interpretations from the theory of probability in the case of normal distributions in frequency series could be used in the case of time series. In the latter case, a normal distribution about a trend line would perhaps be due to the limits of the problem in hand, in other words, to coincidence, rather than in offering a correct description of this distribution in general. Again, in the case of a time series, the emphasis has been displaced from the central character-

cycle does affect the revenues of these companies and affects them in a manner increasingly in sympathy with the fluctuations of general business conditions, the extent of these fluctuations being measured in units of 3.850 per cent and 4.057 per cent of their normal revenues.

When attention is turned to the physical output, which in these cases is taken as the total number of kilowatt-hours billed to customers, very much the same results are obtained. In view of the regulated prices at which the utilities sell their services, it would seem more proper to study the cyclical variations of these enterprises in their physical output rather than in their gross revenues. Chart 68, which presents the cyclical fluctuations of the kilowatt-hours billed to customers, does, in fact, show more uniform movements between these two companies, and more synchronous fluctuations with the general business cycle. Again it is noticeable that there was greater similarity of movements from 1919 on than was evidenced in the previous period, not only between these companies, but also between their output curves and the general business cycle. Furthermore, the movements in these curves are of greater magnitude and are more clearly defined than in the case of the gross revenue curves. The standard deviations of these data also reveal that the fluctuations in the physical output of these companies about their respective norms are greater than the fluctuations in their gross revenues. The standard deviations of these companies *A* and *B*, respectively, are 4.720 per cent and 5.900 per cent. Since all abnormal fluctuations have been eliminated in the analyses,[4] the kilowatt-hours sold thus reveal a somewhat greater variability in response to the change of business conditions.

The industrial light and power sales, the cyclical movements of which are graphically presented in Chart 69, show a still greater harmony in their major movements than the two series just presented. This is true also when they are compared with the general business cycle. Beginning with 1919, the similarity in movements with respect to each other and to the business cycle is more marked than in the case of the other data.

This is the class of revenues into which the business cycle

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istics of the distribution to the characteristics of the distribution at one particular time. The standard deviation, however, even if stripped to this exact mathematical interpretation, offers, nevertheless, a valuable device to describe the extent of the fluctuations from normal.

[4] Unusual monthly fluctuations which were obviously due to (1) an accounting error, or (2) purely sporadic fluctuations, were excluded in order that, as nearly as possible, a picture of the ordinary fluctuations from trend might be preserved.

makes the greatest inroads. Manufacturing establishments are notedly more subject to fluctuating business conditions than are retail distribution establishments. In general, it holds true that there is a decrease in resiliency from the extractive industries down to the distributive industries. That part of public utility revenues which is dependent upon the operations of industrials, therefore, is more affected by the varying capacity at which these industrials are operated.

It is particularly noticeable that beginning in 1919 detailed fluctuations of the curves of income from the sale of industrial power show a high degree of correlation. This agreement in details is not nearly as marked in the case of the other data. One explanation may be that about this time great strides in the development of the use of industrial power were made.

The standard deviations of these data for companies *A* and *B*, respectively, are 4.751 per cent and 6.928 per cent. The fluctuations of the revenues from the sale of industrial power, in other words, are measured in units of 4.751 per cent and 6.928 per cent, respectively, of the normal revenues from these sources. These standard deviations indicate the greater amplitude of the fluctuations of these revenues than obtains in the case of the total revenues from the sale of electricity. This is explained, of course, by the fact that the total revenues included the income from the sale of retail light and power, which class of revenue shows a greater resistance to the ups and downs of the cycle. Revenue from retail light and power still makes up the major portion of the revenues of the two companies.

The industrial kilowatt-hours sold were not obtainable in the case of Company *B*. For Company *A*, the cyclical fluctuations of this series are graphically presented in Chart 70. The years of general depression and prosperity for the period covered by these data can be fairly accurately traced in this curve. When this chart is compared with the chart of the total kilowatt-hours sold for the same company, the same difference that was noticed between the total revenues and the industrial revenues is again apparent—a greater elasticity in the variations from normal. The fluctuations are, in fact, sharper than in the case of the revenues from the sale of this power. This can be explained, of course, on the basis of the graduated rates which are in general use; reduction in demand for industrial light and power during depression subjects the customer to higher unit rates, and hence revenues accruing to the utility do not fluctuate so sharply as do kilowatt-hours billed. The standard deviation of this series is 7.64 per cent, indicating that the widths of the fluctuations which take place are much greater than in the case of any of the other data. This is to be expected for the same reason that greater fluctuation is to be expected in the revenue from this source.

In Chart 71 are presented the variations from normal of the total number of customers of these two companies. The fluctuations in these series present some marked differences from those of the other series already examined. The peaks in these cases occur earlier—in 1916 and 1917. In 1918 there was a decided slump in the customer cycle, due perhaps to the fuel economy which was being practiced during 1918 and 1919 on account of the exigencies of war conditions. The cycle curves did not reach normal again until 1922 and 1923 for Companies *A* and *B* respectively. The peak, which was reached in 1920 for total kilowatt-hours sold and which was reflected also in the revenues of these companies, has no counterpart in the cyclical variations of the number of customers, although in the case of Company *A* there was a sharp increase in the number of customers toward the end of the year. This was not, however, what could be termed a cycle peak.

From a comparison of the charts it can readily be seen that the cyclical variations which occur in these two utilities are least pronounced in the variations of the number of consumers. There is apparently, therefore, less fluctuation in the number of customers than there is in the per capita consumption of electricity. There is, nevertheless, quite a difference in the magnitude of the customer fluctuations of these two companies. In the case of Company *A*, the standard deviation of this series is 2.418 per cent, while in the case of Company *B*, the standard deviation is 5.192 per cent.

To be complete the study of the customers should be broken up into a study of retail customers and industrial customers. Such data, however, were available only in the case of Company *A*, and are presented in Chart 72. Beginning in 1917 the typical cycle years can be fairly accurately traced in this curve of industrial customers. The number of industrial customers thus shows a much greater flexibility in response to general conditions than does the number of total customers. The standard deviation of this series is 2.534 per cent. The magnitude of the fluctuations is, therefore, not very significant.

Finally, the effects of the business cycle upon operating expenses must be studied. This study is presented in Chart 73. Again, operating expenses were not available in satisfactory monthly form for Company *B*. Chart 73, therefore, presents the cyclical variations of the operating expenses of Company *A*, together with the variations of the total revenues of the same company.

The chart shows at once that the fluctuations of the operating expenses are greater in amplitude than are the fluctuations of the gross revenues. There is also a lag in time between the revenues and the expenses; operating expenses show a tendency to follow the movements of the revenues after the lapse of several months. The standard deviation of the operating expenses is 8.037 per cent as compared with 3.850 per cent for the gross revenues. There is thus much greater scope in the fluctuations of the expenses than there is in the fluctuations of the revenues. Here, then, is a place where the effects of the cycle are felt rather keenly by this company. Operating expenses can move in sympathy with changing conditions, while there are no corresponding changes in the revenues which might be effective through prices. The cost of operating cannot be effectively regulated by governmental bodies and, consequently, moves in sympathy with market conditions. On the other hand, rates are changed only on authority from regulatory bodies. Revenues are, therefore, necessarily more inelastic.

From this analysis it is evident that these two companies are becoming increasingly more subject to the influences of cyclical variations in general business conditions. Since 1919 they have evidenced a greater synchronous movement than before. The influences are manifested not only in the revenues of the companies, but to a greater extent in the physical output, to some smaller extent in the number of customers, but to the greatest extent in operating expenses.

In the case of the customer fluctuations, the variations of the number of actual customers are not as significant as the variations in per customer consumption of electricity. The number of customers may not change materially with changing business conditions, but their use of the service varies with their buying power.

Problems which are incident to the electric light and power industry, therefore, probably cannot be divorced from general business problems, and the evidence in the case of these two companies is that the problems are becoming increasingly similar to those of general business. Present indications are that the greatest future development of the electric light and power industry will be in the field of industrial power. Sustained efforts to interconnect electric systems, to bring about diversification of load, and to improve load factors will constantly increase the importance of industrial power to these utilities, and, consequently, will make them more subject to the influences which affect their industrial customers.

If the business cycle would affect industries in such a manner as to cause a lag between various industries sufficient to permit the recovery of one industry from a depression before another industry would be affected by it, then the interconnection of electric utilities would be a means to save them from the effects of these economic oscillations. The business cycle, however, does not ordinarily proceed in a sequence of wave motions from industry to industry. Although there is a definite lag in the response of certain industries to conditions which cause either abnormal prosperity or depression, yet the history of business cycles definitely shows that there are peak and slump periods when all industries are either buoyant or depressed. In a period of prosperity the electric utilities, interconnected or otherwise, would have to furnish sufficient generating equipment to handle the load. It is true that, through interconnection, companies can work out elaborate schemes of diversification, which obviate the necessity of carrying a high percentage of reserve capacity. They must furnish, however, sufficient generating capacity to handle all industries in times of prosperity. This necessarily means that when a depression sets in there will be idle equipment and decreased revenues.

The continued efforts in developing elaborate interconnections will probably tend to involve the utilities deeper and deeper in the problems incident to the business cycle. In their anxiety to work out diversification, they may take on an increasing number of off-peak industrials. This will tend to make the whole interconnected system more dependent upon the industrial load, and anything that will affect any one of these industries will affect the electric system, unless a new industry can immediately be found to take its place.

It is probable, therefore, that the stability which has characterized the industry in the past will not characterize it to such a marked extent in the future. If this proves to be true, many of the present principles of the economics of public utilities will undoubtedly change, and one of the most important of these changes will be in the principles governing public utility finance.

158. Business Fluctuations in the Gas Industry *

. . . Within the past five or six years, the character of the business carried on by the electric light and power and gas utility has changed considerably. The electric light and power industry has entered the field of industrial power, while the gas industry has injected itself into the realm of industrial heating, where, in all probability, its future lies. . . .

In selecting the data to include in the study, four gas utilities, large enough to be representative, were used. These four companies differ somewhat in the character of their business. Companies *A* and *B* are situated in two large cities in the Middle West, and serve a large proportion of industrial consumers, about 25 to 28 per cent of their total sales being to these industrial consumers. Company *C* is located in a city of about 250,000 population in the eastern section of the country. Of the total sales of this company, about 15 per cent is to industrial users. Company *D,* located in a fairly large city of the west coast, sells approximately 2 per cent of its gas for industrial purposes.

In choosing the data upon which to base conclusions, actual sales of gas appeared to be the most logical item to use for statistical purposes. In the case of utilities, revenues are not suitable since they do not react in accordance with changing price levels, and consequently cannot be correlated with the latter. It must be borne in mind that the rates of utility services and commodities are regulated, and regulation, in the past, has proven to be too slow to keep up with changing business conditions, which fact is well portrayed in the experience of the street railways during the period 1917-1920. Again, it must be remembered that the rate schedules of gas utilities vary widely throughout the country. Industrial rates, especially, will be combined in very different types of schedules for each utility. Industrial rates also change considerably with the amount of gas consumed and the time when consumed. Revenues, especially those derived from sales to industrial concerns, will not usually correlate with output, which latter must correlate with actual business conditions.

While the item of operating expenses would probably correlate most closely with changing business conditions, still, in itself, it would not give any proof of the actual financial conditions of the industry.

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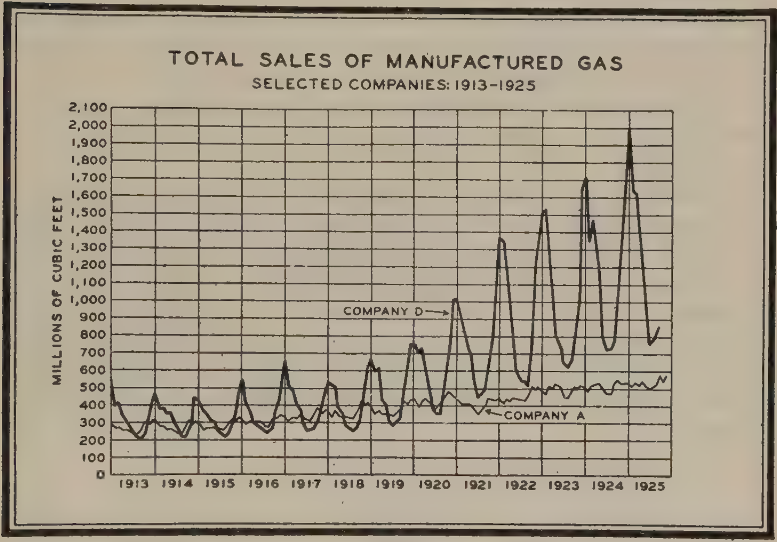
* Excerpt from William G. Maas, *Economic Development of the Gas Industry*, Chapter III. Thesis presented for a M.B.A. degree at Northwestern University School of Commerce, August 1, 1926.

Charts 74 and 75 picture, in absolute amounts, the total sales of gas, by months, for each of the four companies. For Company *A*, it will be noticed that the rise is quite steady, with little tendency to show any increase in the rate. On the other hand, Companies *B* and *D*, whose total sales are much greater in volume than those of Companies *A* and *C*, show an increasing rate of sales. This is especially true of Company *D*, which, contrary to any suppositions has an industrial gas business which is almost negligible. However, in the section of the country in which this company is located, gas is used extensively for heating homes, and with the introduction of improved heaters and stoves, an increasing amount of gas has been, and will be, used for this purpose. One other factor tending toward a large increasing amount of sales of this company's product is that the rates charged are comparatively low, since it has been possible to mix a large amount of natural gas in with the manufactured product.

Chart 74



For Company *C*, situated in a somewhat smaller city in the eastern section of the United States, there appears to be little, if any, tendency toward increased amount of sales in the future. The company, while carrying a certain amount of industrial business, does not give promise of increasing this type of load in the near future.

The increase in sales (for Companies *B* and *D*, especially) may be due partly to the lowering in the quality of gas, which lowering began to be noticed about 1913. Commissions had been fixing the standard quality of gas upon the lighting quality basis, usually requiring companies to supply gas showing 22 candlepower as tested at testing stations located not less than one mile from the company's distribution stations.[1] The New York Commission, taken as an example, found, however, that an increasingly large number of companies were not conforming rigidly to this standard. Several reasons were given for this fact. One was that "the lack of materials, coupled with the unusual and tremendous use of gas, reduced candle power and pressure within the mains of certain companies to such a degree that report was made from many households that gas was being extinguished altogether."[2]

Commissions soon began to look into the advisability of changing from a lighting to a heating standard. While no definite relation exists between candle power and British thermal units, the New York commission's engineers fixed 22 candle-power as approximately 670 B.t.u.'s. At the start, the commission's ruling fixed the standard for companies in New York at approximately 650 B.t.u., but this standard has been gradually lowered. At the present time, the standards for our four companies are as follows:

Company *A*......	528 B.t.u.
Company *B*......	530 B.t.u.
Company *C*......	510 B.t.u.
Company *D*......	850 B.t.u.[3]

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[1] *Annual Report* of the Public Service Commission for the First District of the State of New York, for the Year Ending December 31, 1917, Vol. I pp. 422-426.

[2] *Annual Report* of the Public Service Commission for the First District of the State of New York, December 31, 1917, Vol. I. (*In re* Case No. 2276—Hearing on Motion of Commission as to the quality and pressure of gas within the first district.)

[3] In an explanatory letter accompanying the statistics sent in by this company, it was stated:

> ". . . In comparing the sales from year to year, you will note a very small increase for 1914 over 1913, and a decrease for 1915 in comparison with 1914, but when the difference in heating value of the gas is taken into consideration, this irregular showing is explained. From 1907 to 1912, inclusive, the gas furnished by us averaged about 625 B.t.u. per cubic foot. In the year 1913, we commenced to mix a small quantity of natural gas with the manufactured gas, resulting in an average for that year of 671 B.t.u. 1914, with a

Seasonal Fluctuations.—Probably the most interesting feature brought out by the two charts is that of seasonal variations in the sales of gas. In all four companies it appears that the low point in sales is in either July or August, while the peak is in one of the winter months, usually December or January. These regularly recurring seasonal fluctuations are especially pronounced in Companies *B* and *D*, which fact may be explained partially because of the large amount of gas used for heating purposes in the communities the above mentioned companies serve. In Company *B*, extensive campaigns have been made to promote the use of gas for house-heating purposes, and these campaigns have had results. The geographical location of Company *D* accounts for a large amount of house-heating by gas, since coal furnaces are not an important item in house fixtures.

This increasing amount of seasonal variation has a direct bearing upon rates charged to businesses which can use a large amount of heating gas in the summer months. The problem of the seasonal load factor enters at this point. Indeed, many gas managers throughout the country have shied at the idea of developing a house-heating business, on account of the unfavorable load factor which would result. This feature of seasonal variation presents an interesting problem from the engineering standpoint, which will determine to a large extent the construction of the productive plant. Engineers will have to be guided by the methods of most economical production to take care of the peak loads.

A future offset to this house-heating load which has been created will be the refrigeration load, which is almost entirely a summer load. Much economy can be effected if this type of business can be developed. At a meeting of the Refrigeration Committee of the Commercial Section of the American Gas Association, held in April, 1926, a report was presented by Nils T. Sellman, Utilization Engineer of the Consolidated Gas Company of New York. In discussing refrigeration from a gas company's load standpoint, the report made two important points:[4] (1) that the demand for refrigeration is almost inversely proportional to the monthly house-heating load, and (2) that refrigera-

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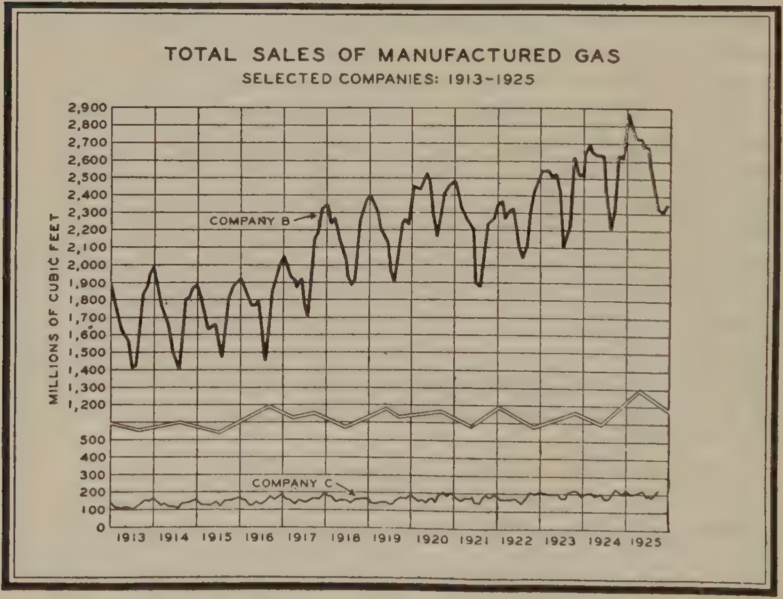
somewhat heavier percentage of natural gas, averaged 710 B.t.u. With a still heavier percentage of natural gas, the years 1915 to 1920, inclusive, averaged from 806 to 821 B.t.u. Effective July 1, 1921, the B.t.u. standard was reduced to 750, which continued until April 1, 1923, when an increase to 850 occurred, and this has been the standard since."

[4] *Gas-Age Record, LVII* (April 24, 1926), 577.

tion would raise the annual average domestic consumption from about 36,000 cubic feet to over 50,000 cubic feet.

While it would appear that it would take a great number of refrigerators to take the place of one house-heating installation, still such business affords a partial relief, and could be taken on with no additional investment on the part of the gas company. Still another obstacle that would have to be overcome is the competition of electrical refrigerating machines, to which the public are more accustomed.

Chart 75



Upon glancing at the curves representing monthly sales for Companies *A* and *B*, it will be observed that a break from the general trend is evident in the year 1921. Since these two companies are characterized by a large proportion of industrial sales, this break immediately suggests the influence of general business conditions upon the business of those gas companies who are emphasizing their industrial heating load. It is evident that in order to obtain the advantages due to increases in industrial business, the gas utility will be forced to sacrifice some of that feature of stability, which the necessity for its commodity for domestic uses resulted in. Gas managers will have to take this fact into consideration, just as now the electric light and power managers are coming around to the same realization.

These breaks in the year 1921, quite noticeable in Companies *A* and *B*, cannot be discerned in the curves for Companies *C* and *D*, whose business is still largely domestic.

In order to study more closely the effects of business conditions on the sales of gas the original data as plotted was corrected for seasonal and long time trends.[5]

In Table 83 are shown the indexes of the average seasonal fluctuations for the four companies. Company *A* shows the least amount of fluctuations, which increase respectively in Companies *B*, *C*, and *D*, the last company exhibiting a great range between the high and low points. Nevertheless the direction of the fluctuation is practically the same in each of the four cases.

TABLE 83

INDEX OF SEASONAL FLUCTUATION OF FOUR GAS COMPANIES

1913–1925

Month	A	B	C	D
January	105	108	113	154
February	96	105	102	132
March	99	103	96	127
April	95	101	95	104
May	96	100	94	93
June	92	98	97	73
July	88	91	90	64
August	95	87	87	62
September	102	93	101	64
October	113	103	109	81
November	108	105	108	103
December	111	107	107	144

Chart 76 shows the results in graphic form. All the data have been reduced to their standard deviation in order to make the four curves comparable.

Previous to 1920 there was no great amount of fluctuation above or below the normal (represented by the zero line in the chart) for any of the companies. However, beginning about the middle of the year 1920, an extended drop, from a high point, is noticeable in both Company *A* and Company *B*. It will have been noticed that the boom of 1920, which was due mainly to a tremendous inflation, is registered in the cycle curves of the first two companies.

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[5] This was done by determining the trend by the "line of least squares" method, and the seasonal fluctuations by the "link relative" method. The two results were then extracted from the original data, and the so-called cyclical fluctuations, combined with any irregular fluctuations, remained.

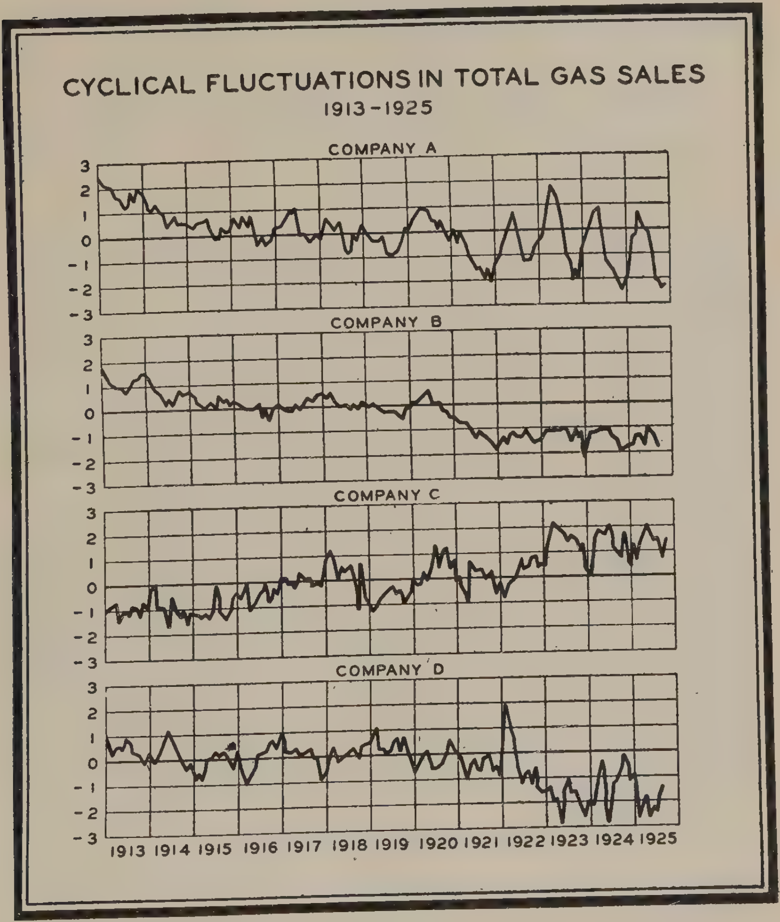
The drop in 1921 in Companies *A* and *B* approximates very closely the same drop in the Harvard Business Curve. From that point, however, the changes in the two curves do not follow the Harvard curve quite so closely, suggesting that, so far, minor fluctuations in business activities have not materially affected the volume of business done by the gas utilities. But on a closer examination of the variations, we note a tendency for our curves to change their direction a good deal in accordance with the changes in the business curve, although these changes are not of the same magnitude. Nevertheless we cannot doubt the significance of the very noticeable drop in the year 1921.

Fluctuations in the sales of Company *A* from 1922 on, present a somewhat incomprehensible situation. The deviations from the upper to the lower limits of the curves widen considerably, and appear to emphasize a variation which might be considered seasonal. However, unlike the typical seasonal variations in gas sales, the peak appears in April or May, rather than in the winter months. Upon examining the data for industrial sales for this company, it was found that the actual figures followed a movement very similar to that shown in the cycle curve. Industrial sales rose to a high point in the month of April or May, after which there was a constant dropping off until the month of September, when the movement changed once more in the opposite direction. Since this type of variation does not follow the typical seasonal variation for total gas sales, it would not therefore be removed from the original data along with the seasonal fluctuations. The effect of industrial sales seems to be very great in the case of this company.

The same point of view was in mind on observing the curve for Company *B*. It was found that such regular recurrence of high and low points in sales (as in the previous company) was not present. On the other hand there was a great variation in the data from month to month.

The reason for Company *B*'s cycle curve remaining below normal after its drop in 1921, is that the straight-line method of determining the trend does not allow for the two very noticeable breaks—one in 1917 and one in 1921. Consequently the resulting figures, representing the normal trend, from which the cyclical figures are ultimately determined, will not be absolutely representative. In this particular case, the figures for the trend line will be slightly high after 1921, with the result that the computed cycles will fluctuate below the normal, which is really the trend,

Chart 76



multiplied by seasonal fluctuations, when in reality they should be both above and below. A correction in the trend from that point on would tend to raise the level of the cyclical fluctuations, thus showing a closer correlation with the business curve.

Companies *C* and *D* fail to show the same amount of correlation with the business curve as do the first two companies. Of greatest importance is the fact that there is no drop in 1921, which goes to prove that these two latter companies are still much more stable, as far as volume of business is concerned, than are the two characterized by comparatively large amounts of industrial sales.[6]

Conclusion.—A word of warning must be added, lest too much be based upon the results shown. It must be remembered that all data have been subjected to complicated statistical treatment, in which original figures have been reduced to type, by means of the assumption that the data are fairly homogeneous. We have shown, however, in the case of Company *A*, that there cannot be said to be a really typical seasonal fluctuation in this case.

Nevertheless, taking the results as a whole, we are justified in making more or less general conclusions from the results portrayed. In the first place, seasonal fluctuations are of extreme importance in the matter of gas sales, and present both an engineering and commercial problem. When making rates, consideration must be given this problem of seasonal load. Again, a good merchandising policy would attempt to increase sales in the summer months in order to level off the load curve, thus resulting in a more efficiently and economically operated plant.

The main point to be indicated, however, is the increasing instability to be experienced by gas companies, due to the increasing proportion of industrial sales, which sales will be reflected in the business conditions of the times. We feel safe in assuming that as the proportion of industrial sales increases further, the cyclical fluctuations will follow even more closely the curve of business conditions. The industrial gas business is still in its early stages, and with attractive rate schedules, and proper education of potential customers, there is a great possibility of a very large increase in this type of business.

159. Electric Railway Revenue *

We have long since ceased to regard the dollar as an accurate yard-stick, and though its use opens many paths of error, it will serve to demonstrate, in another dimension, the horizontal integration of the electric railway industry. The U. S. Bureau of the Census has classified operating companies into three income groups: Class *A* consists of those with yearly revenues of more than $1,000,000; Class *B*, those with revenues of $250,000 and more but less than $1,000,000; and Class *C* includes all companies with revenues of less than $250,000.

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[6] The lowering of the curve for Company *D* in 1923, and its continued low level, can, in all probability, be explained in the same manner as was done in the case of Company *B*.

* Excerpt from Lyford Green, *Electric Railway Securities as an Investment*, thesis presented for the M.B.A. degree, Northwestern University School of Commerce, 1927.

TABLE 84

OPERATING ELECTRIC RAILWAY COMPANIES CLASSIFIED ACCORDING TO OPERATING REVENUE

		COMPANIES			
		All	A	B	C
1922	Number of Companies.....	858	146	204	508
	Per Cent	100.0	17	23.8	59.2
1917	Number of Companies.....	943	114	179	650
	Per Cent	100.0	12.0	19.0	69.0
1912	Number of Companies.....	975	91	155	729
	Per Cent	100.0	9.3	15.9	74.8
1907	Number of Companies.....	939	76	130	733
	Per Cent	100.0	8.1	13.9	78.0
1902	Number of Companies.....	799	44	81	674
	Per Cent	100.0	5.5	10.1	84.4

A glance at the above table shows that the number of *A* companies has increased from 5½ per cent in 1902 to 17 per cent in 1922, *B* companies from 10 per cent to 23 per cent, and the number of *C* companies has decreased from 84 per cent to 59 per cent. The increase in the proportion of larger companies was not simply à phenomenon of the formative period; for it will be noted that the *A* and *B* companies each increased 5 per cent in the period 1917 to 1922 with a corresponding decrease of 10 per cent of the *C* companies.

Thus the electric railway industry measured in the physical sense by miles of track, and in the economic sense by dollars of revenue, has been, and is going through a period of integration as evidenced by the merger and consolidation of the small units into larger operating corporations.

City and suburban mileage constitutes a little over one-half the total trackage, 59½ per cent as compared with 40½ per cent of interurban mileage. Geography has played an important part in the development of interurban railways for almost all the great electric railway systems are to be found in the New England States, Pennsylvania, Ohio, Indiana, Illinois, and Wisconsin. The geographical situation suggests that under normal conditions well settled districts having towns and cities scattered about within a fifty-mile radius are necessary as nodi to a successful interurban network, for these are the conditions that imply a high traffic density.[1]

The economic security of the interurban railways appears to be relatively less than in the case of urban properties because the former are ground between the millstone of steam railroads for long hauls and the motor truck for short hauls. Their future on this account is extremely uncertain and many lines have already been abandoned and the companies ruined.[2] But nevertheless the relationship between city and interurban trackage has remained surprisingly constant throughout the period 1912 to 1922, varying only 0.7 per cent. This relationship apparently is not undergoing a change in the course of the evolution of the industry.

The changing economic status of the electric railway industry has not been a phenomenon of mere growth. The industry has broadened out and there has been a constantly increasing percentage of revenue derived from furnishing heat, light and power service; for example in 1912 only 6½ per cent of the total revenue came from this source while these services yielded 9¼ per cent of the revenue in 1922.

The practice of combining transportation and these other electric services has not been uniformly adopted. The New England and Middle Atlantic Districts derived only about 3 per cent of their revenue from this source but the practice was more prevalent in the South Atlantic, East South Central, and West South Central sections where nearly 20 per cent of the total income was from this source. It is significant however that in every section, except the Pacific and Mountain Districts, the per cent of revenue from light, heat and power has steadily increased through the period 1912 to 1922.

But though the per cent of revenue derived from heat, light and power has increased, the per cent of companies giving this varied service has decreased from nearly 19 per cent in 1907 to 14 per cent in 1922. This evidence would indicate that small companies have found it uneconomical to diversify their operations and that this phase of development is becoming more and more restricted to the large operating companies and this principally in the Southern agricultural states.[3]

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[1] L. Chamberlain, *Principles of Bond Investment* (New York: H. Holt & Company, 1911), p. 322.

[2] J. E. Kirshman, *Principles of Investment* (Chicago: A. W. Shaw Company, 1924), p. 523.

TABLE 85

PER CENT OF COMPANIES DOING A LIGHTING SERVICE TO ALL OPERATING COMPANIES *

	1922		1917		1912		1907	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
All Companies	858	100	943	100	975	100	813	100
Companies with Lighting Service .	124	14..4	159	16.7	168	17.2	112	18.6

* Compiled from figures published by U. S. Bureau of the Census—*Census of Electrical Industries—Electric Railways—1922.*

The inference that the character of operating companies differs materially according to geographic divisions is substantiated in the summary table. It should be noted that the tendency toward diversification, as measured by the per cent of companies engaged in this service, is most marked in the South Atlantic, West North Central, West South Central, and East North Central divisions. In fact these states, cutting a belt north and south through the middle of the United States and extending along the South Atlantic Coast have a 10 per cent higher average of companies furnishing commercial lighting than the average of the United States as a whole. This conforms with the results obtained when the per cent of revenue derived from heat, light and power was used as an index.

The economic development of the industry goes a long way in explaining the difference in the extent to which electric railways in the various geographic divisions have entered the field of commercial lighting. When the electric railways became popular in the nineties they first entered the more densely settled areas such as the New England and Middle Atlantic districts. These sections, as a rule, were already provided with electric lighting service and, though the management probably realized the economies which could be obtained by combining the generating capacities of these utilities, public sentiment at this time was adverse to large corporations and would not permit the consolidation. Private capital was more reluctant to venture into the southern and western districts and consequently utilities in these sections developed at a later date. But when capital deemed it profitable to invest in utilities in southern and western districts, electric railways had already proved their merit as a field for investment and the public had already forgotten their fears of large corporations. Thus unhampered by public opinion, and cognizant of the operating economies possible by combining their generating capacities, these two utilities tended to develop together in more recent years. . . .

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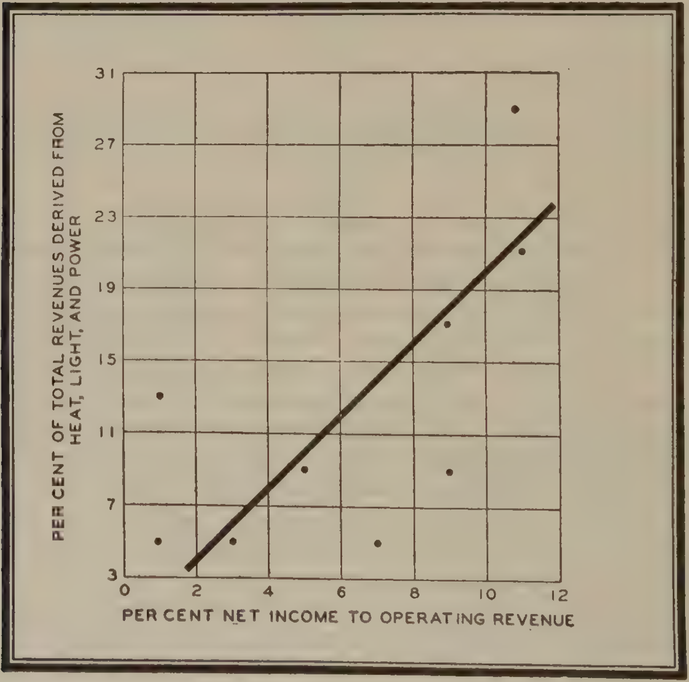
[3] See accompanying tables.

Chart 77—Per Cent of Net Income to Operating Revenue—Electric Companies.



From the comparative income accounts for companies with and without commercial lighting it is apparent that those giving this additional service are in a much more advantageous position than those doing strictly a transportation business. In 1922, and this is characteristic of the relationship existing throughout the period, the former received 19.9 per cent of the operating revenues, and 18.4 per cent of the deductions from gross income; thus allowing this class of companies to receive 38.1 per cent of the net income, to pay 31.4 per cent of the dividends, and to set aside 50 per cent of the total amount devoted to surplus. The chief advantage gained by the companies furnishing commercial lighting is in the lower operating expenses, as is illustrated in 1922 when only 65.4 per cent of their total income went for this purpose as compared with 70.5 per cent for the other class of companies. Economy in operation, coupled with lower demands by fixed charges of about 1.7 per cent enabled these companies to maintain this advantageous position. . . .

Further evidence of the more advantageous position of companies giving commercial lighting service is shown by the tendency for correlation of the per cent of net income to operating revenues of the nine geographic divisions with the per cent of revenue derived from heat, light, and power to total revenues. And though this is but a crude measurement it is suggestive that a high per cent of net income to operating revenues is more often found where a larger proportion of total operating revenues are derived from heat, light, and power service.

The per cent distribution of the income account by size groups indicates that the least risk is attached to Class *A* companies; Class *B* running a close second, and Class *C* a poor third. Class *A* companies, because of lower operating expenses, is the only

TABLE 86

COMPARISON NET OPERATING REVENUES

	CLASS		
	A	B	C
1922 Net Operating Revenue	13.97	14.00	7.68
1917 Per Car Mile (cents)[a]	12.37	12.09	8.78
1912	12.77	11.72	8.99
1907	10.93	9.80	8.10
1922 Net Operating Revenue	2.19	3.26	2.02
1917 Per Revenue Passenger (cents)[a]	2.20	2.85	2.26
1912	2.40	2.87	2.44
1907	2.20	2.49	2.28
1922 Average Passenger Revenue	6.57	8.23	7.35
1917 Per Revenue Passenger (cents)[a]	5.16	6.37	5.85
1912	5.08	6.10	5.87
1907	4.99	5.61	4.98

[a] *Census of Electrical Industries, Electric Railways,* 1922.

group which judged from its per cent of income from all sources, has more than its proportionate share of gross income, though Class *B* closely follows. And similarly in 1922 Class *A* had 5.7 per cent more than their share of net income as compared with Class *B's* 0.6 per cent and with a loss to Class *C* of 6.3 per cent. Furthermore Class *A* companies have set aside an average, for census years 1907 to 1922 inclusive, of 2.5 per cent of their income from all sources as compared with 2 per cent for Class *B* and 1.8 per cent for Class *C*.

Class *A* companies also show an advantage in net operating revenue per car-mile for each of the census years except 1922 when Class *B* companies pulled ahead.

In net operating revenues per revenue passenger Class *B* is consistently in the lead due to its higher average passenger revenue per revenue passenger. From this data it would appear that Class *B* companies were operating under more favorable conditions, at least more sympathetic rate-making bodies, and that the reason for Class *A* companies being in the more advantageous position from the standpoint of earnings is due to lower operating expenses and possibly more efficient management.

The comparative income statements of companies operating

TABLE 87

Per Cent Distribution of Operating Companies in 1922, by Character of Company, Classified by Geographic Divisions *

	Total No.	X[a]		Y[b]		Z[c]	
		No.	Per Cent	No.	Per Cent	No.	Per Cent
United States	853	717	84.06	125	14.65	11	1.29
New England	78	73	93.59	4	5.13	1	1.28
Middle Atlantic	233	219	93.99	11	4.72	3	1.29
East North Central	203	165	81.28	37	18.23	1	.49
West North Central	76	58	76.32	16	21.05	2	2.63
South Atlantic	78	47	60.26	30	38.46	1	1.28
East South Central	41	36	87.80	5	12.20	..	...
West South Central	53	41	77.36	11	20.75	1	1.89
Mountain	35	29	82.86	4	11.43	2	5.71
Pacific	56	49	87.50	7	12.50	..	...

[a] Class X companies without commercial lighting.

[b] Class Y companies with commercial lighting.

[c] Class Z roads operated part time, or by animal traction, or for franchise purposes.

* Compiled from data given in Bureau of the Census, *Census of Electrical Industries, Electric Railways.*

city lines exclusively and companies operating interurban lines exclusively immediately cast away any doubts regarding the superiority of the urban properties from the financial standpoint. In the period 1922 to 1925 the ratio of operating expenses increased from 72.4 per cent to 73.4 per cent as compared with an increase from 76.0 per cent to 84.6 per cent. And whereas the per cent of net income to operating revenue decreased from 6.9 per cent in 1922 to 4.9 per cent in 1925 for urban companies, in the case of interurban companies the decline was from 7.2 per cent in 1922 to a negative 5.6 per cent in 1925.

No further analysis of the figures is necessary to show the marked difference in financial security of these two types of companies; but it is interesting to note the apparent correlation in the per cent of urban mileage to total mileage in the nine geographic divisions with the per cent of net income to operating revenues for these divisions in 1922, which though far from perfect is at least suggestive.

Chart 78—Per Cent Net Income to Operating Revenue—Electric Railways.

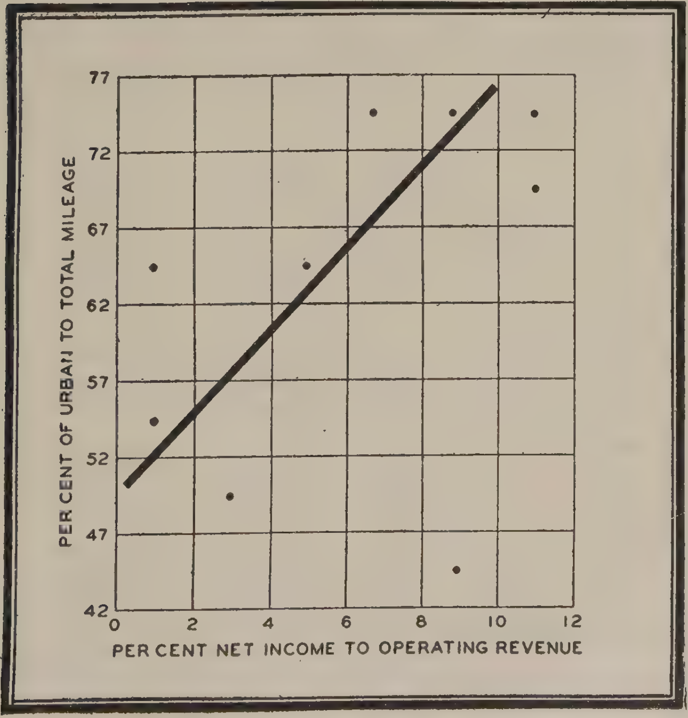


TABLE 88

PER CENT OF REVENUE DERIVED FROM LIGHT, HEAT AND POWER TO TOTAL REVENUE OF ELECTRIC RAILWAY COMPANIES, FOR YEARS 1922–1912

DIVISION AND STATE	CENSUS YEAR	(a) LIGHT, HEAT AND POWER REVENUE[a]	(b) TOTAL REVENUE	$\frac{a}{b}$
United States	1922	$94,078,216	$1,016,719,092	.0925
	1917	59,629,985	709,825,092	.0840
	1912	36,500,030	567,511,704	.0643
Geographic Divisions:				
New England	1922	3,174,305	92,140,311	.0344
	1917	2,037,455	68,399,091	.0298
	1912	1,384,764	55,440,449	.0250
Middle Atlantic	1922	10,116,318	323,700,362	.0313
	1917	5,020,817	234,199,512	.0214
	1912	3,381,090	191,676,824	.0176
East North Central	1922	24,397,550	259,874,929	.0939
	1917	17,013,002	178,871,744	.0951
	1912	8,330,313	135,275,159	.0616
West North Central......	1922	8,252,817	80,424,544	.1026
	1917	5,143,076	57,842,458	.0889
	1912	2,233,356	44,881,324	.0498
South Atlantic	1922	27,579,431	90,270,833	.3055
	1917	13,554,097	56,536,674	.2397
	1912	7,089,358	39,458,505	.1797
East South Central......	1922	4,718,450	26,219,274	.1800
	1917	4,194,052	20,646,869	.2031
	1912	2,766,420	17,084,483	.1619
West South Central......	1922	8,567,476	42,396,857	.2021
	1917	3,424,726	23,048,002	.1486
	1912	1,860,737	17,030,510	.1093
Mountain	1922	1,846,054	14,957,664	.1234
	1917	1,530,533	11,815,127	.1295
	1912	2,628,273	11,102,619	.2367
Pacific	1922	5,425,815	84,212,799	.0644
	1917	7,712,227	56,500,291	.1365
	1912	6,825,719	54,487,197	.1253

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[a] Bureau of the Census, *Census of Electrical Industries, Electric Railways*, 1922.

The superiority of Class *A* companies and companies operating urban lines exclusively has previously been noted. Naturally then, one would expect to find Class *A* city-lines to be in the strongest financial position; but if the figures of the American Electric Railway Association may be regarded as typical it appears, contrary to the original hypothesis, that Class *B* city-lines were in the most advantageous position from a financial standpoint in the period 1922 to 1925 inclusive.

Upon the assumption that deductions from gross income fairly accurately represent the bond interest it is seen that the times interest earned was consistently higher in the case of Class *B* companies than in the *A* group—Class *C* companies most frequently being unable to meet interest charges from gross income. And in spite of the higher operating ratio of the Class *B* companies as compared with the *A* group, Class *B* city-lines had a higher per cent of net income to operating revenue than Class *A*.

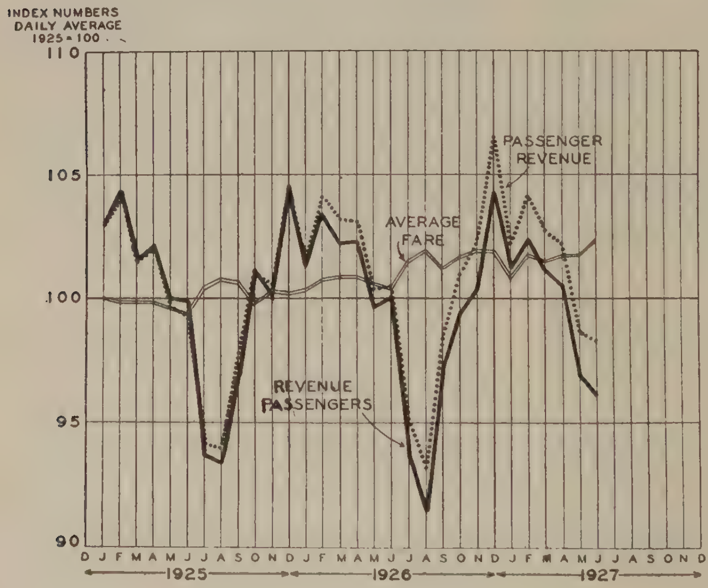
The income accounts by size groups for interurban lines during the period 1922 to 1925 inclusive, indicate that in this field Class *A* companies are much the stronger as evidenced by lower operating ratios, and higher average per cent of net income to operating revenue. In fact, Class *A* companies are the only group which exhibit any degree of stability.

160. Electric Railway Traffic Fares and Revenue

Chart 79

TREND OF TRAFFIC FARES AND REVENUE
134 ELECTRIC RAILWAY COMPANIES
1925 TO 1927

BASED ON AVERAGE DAILY NUMBER OF REVENUE PASSENGERS AND PASSENGER REVENUE

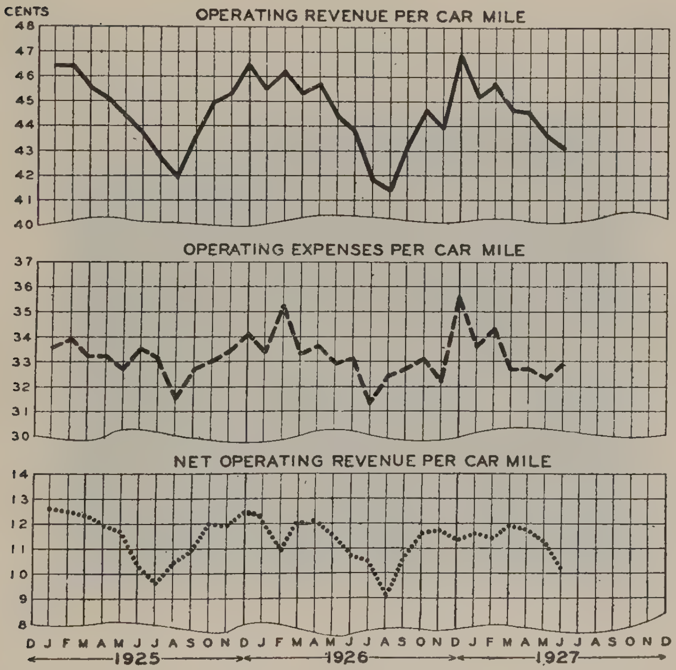


161. Electric Railway Revenues and Expenses

Chart 80

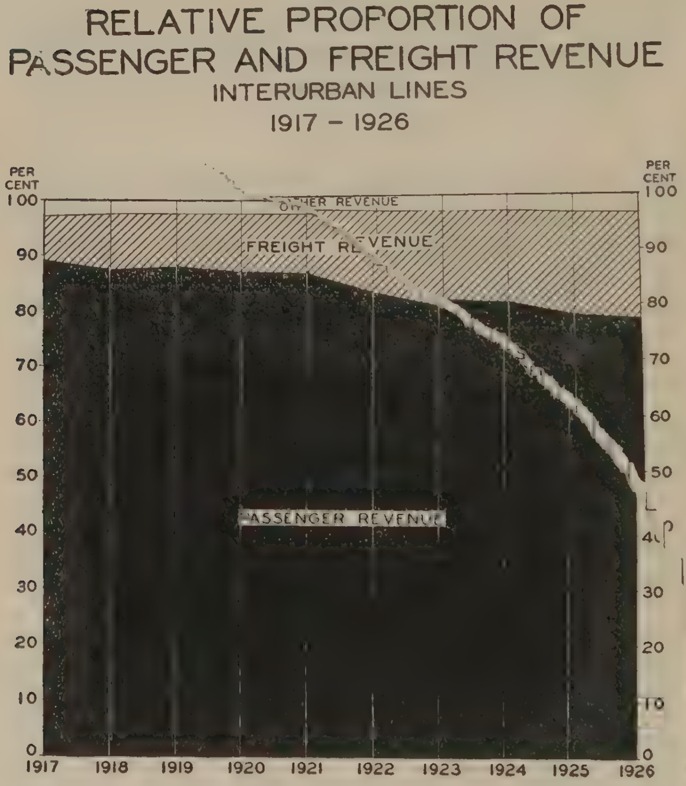
TREND OF REVENUES AND EXPENSES PER CAR MILE

134 ELECTRIC RAILWAY COMPANIES



162. Electric Railway Passenger and Freight Revenue

Chart 81



RELATIVE PROPORTION OF PASSENGER AND FREIGHT REVENUE
INTERURBAN LINES
1917 – 1926

BASED ON REPORTS OF 104 INTERURBAN COS.

163. Effect of Fare Increases Upon Street-Railway Traffic and Revenues *

Local transportation facilities are no doubt essential to every large urban community, but not all the transportation service taken is essential in the sense that people have to take the rides no matter what they cost. It is a commonplace in street-railway philosophy that short-haul and off-peak riders are the most profitable, if the cars can only get a lot of them. An increase in unit fares tends to diminish, or at least to check the development of, these kinds of traffic. And so we have a very pretty problem in street-railway operation. The increase in unit fares, which seems so simple and so logical a remedy where costs have increased, may have the double effect of ''killing the goose that lays the golden egg'' for the operators, and of so restricting the usefulness of the cars as to destroy their character as a public utility for general convenience. . . .

In order to secure material on the subject a special questionnaire was sent to all of the principal street-railway systems of the country to secure detailed month by month information from January 1, 1917, to the date of inquiry. . . .

From these data it was possible to compare fare changes and growth in traffic and revenues, for the first nine months of 1919 with the first nine months of 1917, on systems which together carried more than 75 per cent of the street-railway traffic of the country. The year 1918 was left out of consideration because traffic during that year was abnormally low except in spots. . . .

In order to draw reliable conclusions from the available data, it seemed necessary to get a mass effect, and so the transportation areas or systems were divided into four groups, as follows:

Group A, where fares were not increased more than 3 per cent.

Group B, where fares were increased between 3 and 10 per cent.

Group C, where fares were increased between 10 and 25 per cent.

Group D, where fares were increased more than 25 per cent.

The results of the analysis are shown in the following table taken from my report to the commission:

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* Excerpts, Delos F. Wilcox, "Effect of Fare Increases upon Street-Railway Traffic and Revenues," *National Municipal Review*, IX (1920), 633-636.

TABLE

General Summary of Analysis of Effect of Fare Increases upon United

Class	Number of Cities or Systems in Class	Number of Revenue Passengers Carried First 9 Months of 1917	Per Cent of Total Electric Railway Traffic of Country	Average Fare per Revenue Passenger First 9 Months of 1917, Cents
A	13	2,465,440,094	29.16	4.93
B	11	908,511,165	10.74	4.98
C	29	1,583,795,790	18.73	5.28
D	15	1,521,714,987	18.00	4.62
All	68	6,479,462,026	76.63	4.95

This table shows pretty clearly the relation of fare increases to increases in traffic and revenue:

	A	B	C	D
Fares increased	0.41%	6.63%	17.80%	41.77%
Traffic increased	15.08%	10.73%	6.65%	7.54%
Revenues increased	15.65%	18.11%	25.63%	30.97%

It is clear from these figures that fare increases did not go far enough in any of the groups of cities to cause a decrease in revenue; but an average increase of approximately 42 per cent in the fares yielded an increase of 31 per cent in revenue, while stationary fares brought in 15 per cent more revenue through normal traffic growth. Translated into plain English, this means that a seven-cent fare would ordinarily bring 15 per cent more revenue than would have been brought in by the five-cent fare during the same period.

A comparison of the results in the eight greatest transportation areas of the country for the first six months of 1919 with the results for the corresponding period of 1917 seems to show the definite effects of fare increases in individual communities, as will appear from another table taken from my report to the commission. In this case, I have included 1918 also in the comparison, and have indicated in the footnotes the status of the fares on each particular system. The growth of jitney traffic in Newark is included for comparison with the decrease of traffic on the Public Service Railway system. The table follows on p. 840.

89

Traffic and Revenues of Principal Street Railway Systems of the States

Number of Revenue Passengers Carried First 9 Months of 1919	Average Fare per Revenue Passenger First 9 Months of 1919, Cents	Per Cent Increase in Average Fare Paid First 9 Months of 1919 Over First 9 Months of 1917	Per Cent Increase in Number of Revenue Passengers Carried First 9 Months of 1919 Over First 9 Months of 1917 (D—indicates decrease)	Per Cent Increase in Passenger Revenue First 9 Months of 1919 Over First 9 Months of 1917
2,837,238,677	4.95	0.41	15.08	15.65
1,005,987,031	5.31	6.63	10.73	18.11
1,689,085,597	6.22	17.80	6.65	25.63
1,406,987,088	6.55	41.77	7.54(D)	30.97
6,939,298,393	5.64	13.97	7.10	21.96

These figures tend to show that unlimited fare increases present a very serious problem from the social point of view, and that a program of continued private management requiring sufficient revenue from the fares to yield a return attractive to new investors has an altogether uncertain future. Some street-railway men are of the opinion that as long as the roads need more money fares should be increased up to the point where they yield the maximum revenue that can be extracted from the pockets of the fare-payers. It hardly seems appropriate at this stage of urban development to make ability to sustain itself from the fares collected the touchstone of public necessity in local transportation service.

TABLE 90

REVENUE PASSENGERS CARRIED ON PRINCIPAL URBAN STREET-RAILWAY SYSTEMS FOR THE FIRST SIX MONTHS OF 1917, 1918, AND 1919

SYSTEM	REVENUE PASSENGERS JANUARY TO JUNE, 1917	REVENUE PASSENGERS JANUARY TO JUNE, 1918	REVENUE PASSENGERS JANUARY TO JUNE, 1919
1. New York Elevated, Subway and Surface Lines	990,535,666[a]	979,221,796[a]	1,091,844,103[a]
2. Chicago			
Elevated Lines	97,203,477[a]	102,121,490[a]	95,101,135[b]
Surface Lines	346,361,384[a]	328,732,667[a]	373,938,449[a]
All Lines	443,564,861	430,854,157	469,039,585
3. Philadelphia Elevated, Subway and Surface Lines	291,942,084[c]	306,846,686[c]	348,592,436[c]
4. Boston Elevated, Subway and Surface Lines	190,250,992[a]	185,699,883[a]	168,383,307[d]
5. Public Service Railway (N. J.)	174,998,110[a]	175,354,680[a]	158,214,468[e]
6. Detroit (one-fare zone)	157,794,827[f]	132,543,905[g]	150,643,390[h]
7. Cleveland	143,766,868[i]	142,083,699[j]	139,722,656[k]
8. Pittsburgh	131,789,642[a]	116,428,150[l]	122,319,998[m]
9. Newark Jitneys	4,466,377[n]	7,516,608[n]	16,249,008[n]

[a] 5-cent fare with free transfers.

[b] 6-cent fare with free transfers.

[c] 5 cents initial fare with 3 cents exchange tickets at a majority of transfer points.

[d] 8-cent fare with free transfers.

[e] 7-cent fare during 4 months and 28 days, and 6-cent fare during 1 month and 3 days, with 1-cent initial transfer charge during the entire period.

[f] Mixed system of fares; average fare per revenue passenger, 3.62 cents.

[g] Mixed system of fares; average fare per revenue passenger, 4.57 cents.

[h] Mixed system of fares; average fare per revenue passenger, 4.66 cents.

[i] Mixed system of fares; average fare per revenue passenger, 3.40 cents.

[j] Mixed system of fares; average fare per revenue passenger, 3.84 cents.

[k] Mixed system of fares; average fare per revenue passenger. 5.29 cents.

[l] Mixed system of fares—changed twice during period; average fare per revenue passenger, 5.51 cents.

[m] A double zone system; average fare per revenue passenger, 6.27 cents.

[n] 5-cent fare without transfers.

164. Income Statement of Gas Companies *

TABLE 91

COMBINED INCOME STATEMENT OF 234 GAS COMPANIES FOR 1925

Representing 65 per cent of the total annual sales of manufactured gas in the United States.

	ACTUAL	PER THOUSAND CUBIC FEET SOLD
Gross Operating Revenue		
Sales of Gas	$275,035,521	$1.016
Miscellaneous Operating Revenue	10,195,523	.038
Total Gross Operating Revenue	285,231,044	1.054
Operating Expenses	193,880,170	.716
Taxes	24,342,567	.090
Total Operating Expenses	218,222,737	.806
Income from Operations	67,008,307	.248
Non-Operating Revenue	20,909,480	.077
Gross Income	87,917,787	.325
Income Deductions	27,794,447	.103
Net Income Available for Dividends and Surplus	60,123,340	.222
Operating Ratio (per cent)	76.5%	77.0%

165. A Comparative Study of Electric and Telephone Revenue †

An analysis of revenue is fundamental to an understanding of the public service industries. It bears upon all aspects of the industries, whether operating, managing, or financial; and furnishes a more or less exact index of the demand for public utility services.

Such analysis must consider not only the amount, but the stability of revenue. To what extent is revenue affected by the variable market conditions? Is the reputed stability of the public service industries a misconception? These questions, pertinent at any period in the life of the industry, become particularly so after the rapid development of the industry which has taken place in the last eight years.

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* *A. G. A. Monthly*, January, 1927, pp. 13-14, "Comparative Financial Statistics of 234 Manufactured Gas Companies, 1924-25."

† Adapted from Warren H. Marple, *Public Utility Revenue: Its Characteristics and Peculiarities*, thesis presented for the M.B.A. degree, Northwestern University, School of Commerce, 1928.

This article should make apparent the fact that although the public service industries as a whole have characteristics which distinguish them from non-utility enterprises, they may also differ among themselves in more than one important regard.

Sources of Revenue

The public service industries are usually dependent on no one class of service for their entire revenue, but derive it from a number of different sources. Because of the monopoly position which they hold in their operating territory, the utilities provide their services to all classes of consumers,—business, industrial, and residential.

Electric Light and Power Revenue.—The electric light and power industry in 1927 earned a total revenue of $1,783,000,000. Electric lighting revenue constituted about one-half of the total (45 per cent) and power revenue nearly one-third (32 per cent), while street lighting and sales of current to street-railways and other electric companies made up the remainder. Power sold to street and interurban railways amounted to 48 millions in 1927, a scant 5 per cent of the total. Street lighting revenue was practically as large while inter-company sales were more than 7 per cent of the total.

Power and lighting were thus the two principal sources of the electric industry's revenue. Power sales which earned only one-third of the total revenue required one-half of the production. The lighting load consumed only one-fifth of the kilowatt-hour output but provided half the total revenue. The rate charged for current is the connecting link between production and revenue. It is naturally higher for retail lighting than for wholesale power. In 1927 when the average rate for all classes was 2.5 cent per kilowatt-hour, the lighting revenue averaged 6.5 cents and power 1.5 cents. In the same year the average annual revenue per customer was $80.

Each class of revenue may be further divided. The lighting load is made up of the commercial and the domestic services. These two classes, while in practice hard to distinguish, are significantly different. Domestic lighting provides a very substantial revenue. The lighting of streets and highways was at one time as large a revenue producer as any class of business and stimulated the construction of a number of early generating systems. And even now when newer sources have dwarfed this one in importance, street lighting still has the possibilities of earning a very desirable return.

Electric power, like lighting, is provided for domestic as well as industrial and commercial use. The domestic use of power has been stimulated not so much for the large amount of revenue immediately realized as for the very desirable addition it makes to the domestic revenue received from retail distribution. A much higher load factor is obtained through the sale of domestic power. The commercial power is generally used in lighter operations than is the case with the heavy industrial power. Street-railways are in an intermediate class as regards the rates they pay for their electric power.

Territorial Differences.—A diversity of conditions exists throughout the United States, making it impossible to present any single picture which is typical of all sections. Companies operating in certain sections of the country, notably certain of the agricultural and Mid-Western companies, are largely dependent on lighting sales for their revenue. On the other hand, those in the more highly industrialized parts of the country have heavy demands for power. A number of factors influence the proportion of revenue derived from lighting and power, and from the residential as differentiated from the commercial and industrial consumers.

As a rule, the conditions are such in small isolated territories that plants earn only the smallest part of their revenue from power, the greater part coming from lighting. Municipal plants as a class are in this position, although there are some exceptions. And, too, hydro stations may often be able to dispose of large blocks of power to industrial concerns at wholesale rates. The primary factor affecting each plant or system, however, is the nature of the territory served—whether it is commercialized, highly industrialized, or is mainly residential.

Telephone Revenue.—The revenue of telephone lines in the United States was slightly less than $1,000,000,000 in 1927. This was considerably less than the earnings of the electric industry which have grown more rapidly over the last quarter of a century. Since all but 3 per cent of the total telephone revenue is earned by large companies,[1] they are sufficiently representative of the industry to warrant sole consideration in this discussion. Large Class A telephone companies earned revenue amounting to $952,000,000 in 1927.

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[1] Companies earning more than $250,000 in the Interstate Commerce Commission classification.

Exchange revenue and toll revenue are the two principal classes distinguished both by the technological operations involved and the nature of the demand for the service.

Exchange revenue is that derived from operations carried on within a single local area, usually comprising a single city or town, although other bounds are set at the discretion of the managements. Toll revenue, on the other hand, is derived from services *between* the exchange areas. These long-distance connections carry, of course, a higher rate of charge than the local service.

In addition to these two main sources there are the various sub-classes. Exchange revenue is classified as subscriber's station, pay station, and miscellaneous. Toll revenue is divided into the message toll and miscellaneous toll-line revenue. In addition, there are the license revenues paid from one company to another. But these, because of their inter-company nature, are not considered in the total for the industry.

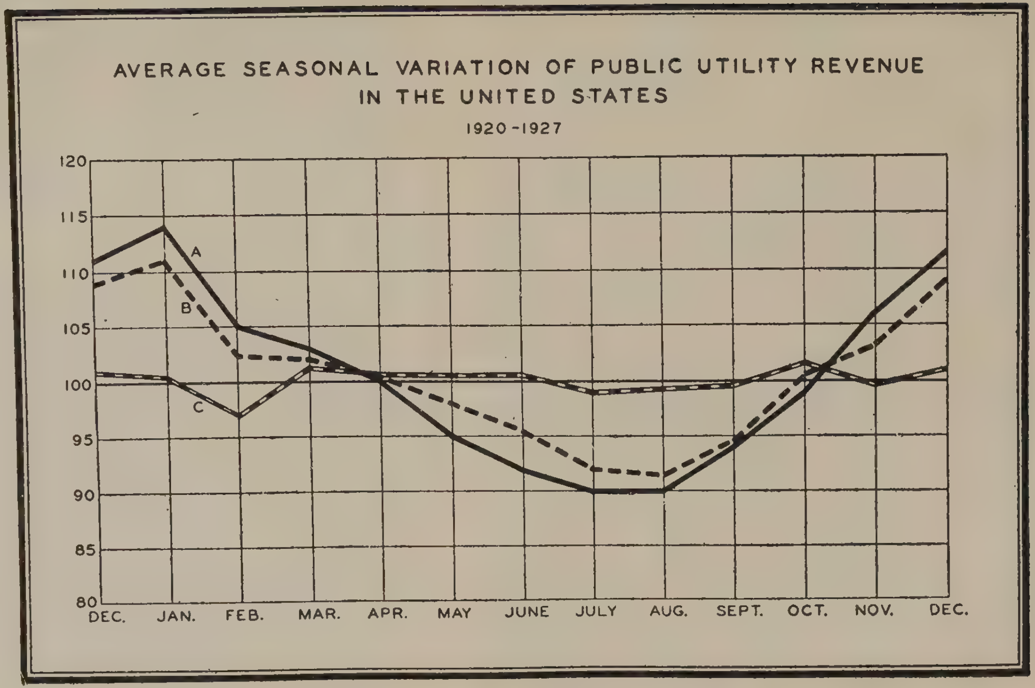
Importance of Each Source.—Exchange revenue is by far the largest part of the total. In 1927 over two-thirds was derived from this source alone. Tolls for long-distance service comprised 30 per cent of the total. A small amount was derived from miscellaneous sources (including directory advertising) amounting to 2½ per cent of the total. Non-operating sources contributed an amount equivalent to 3 per cent of total gross revenues.

Sources of Exchange Revenue.—Exchange revenue arises from use of the service by both business and residential subscribers. The distinction between the two uses, while clear in theory, in practice is extremely vague and difficult to make. For this reason there are no national statistics available to indicate what proportion is contributed by each.

An accounting classification, however, distinguishes subscriber's station from public pay station revenue. Ninety-two per cent of exchange revenue is derived from the former and only 6½ per cent from the public pay stations. Miscellaneous sources are of minor significance. The relative importance of each class has remained remarkably constant over the last fifteen years.

Sources of Toll Revenue.—The second principal source is divided into only two main classes—message tolls (90 per cent) and miscellaneous toll-line revenue (10 per cent). The latter class comprises the rentals from leased-lines, which are being used in greater number, both for handling the large and

Chart 82



AVERAGE SEASONAL VARIATION OF PUBLIC UTILITY REVENUE IN THE UNITED STATES

1920-1927

complicated radio broadcasting programs and for purely private business.

Commercial areas furnish a large proportion of toll revenues, in the Eastern seaboard states especially. Certain of the Pacific Coast states as well as the North Central group also earn heavy toll revenues. In these districts where there is a large volume of commercial transactions the necessary communication between distant buyers and sellers is handled in increasing amounts over the toll lines of the telephone system. This commercial use makes itself manifest in all phases of toll operation, affecting their density and their timing, stimulating use in months of greatest activity and easing them up during recessions.

Toll revenue is also found to be larger than average in the metropolitan areas of the East. New York City and its suburbs give rise to a large toll traffic connecting the city offices with suburban residences and factories. Every fifth call originating in New Jersey is a toll call passing from one town to another or into the neighboring states. This tremendous volume of long-distance traffic although conducted for a low average charge has an important influence on total revenue.

The commercial and industrial area of Southern New England presents much the same situation.

Comparison of Sources of Telephone and Electric Revenue

These two important public service industries derive their revenue from sources having much in common. Both the electric and the telephone industries provide a number of classes of service, each with its own peculiar characteristics. There is, first of all, the large residential revenue. Secondly, there is the business and industrial revenue. The former is a retail or small-lines service furnished to scattered households at a greater unit cost and consequently higher rate. It does not, however, vary greatly with changes in business conditions and hence contributes to the total revenue a valuable element of stability.

Telephone exchange revenue compares closely with electric lighting revenue in that it is a high class business of fundamental importance to the industry. There are evidences, however, that other classes of revenue are encroaching on these two to assume a constantly greater part of the total.

Electric lighting is slowly giving way to electric power, although the change is now proceeding less rapidly than in the past. Street lighting, particularly, has given up its former place of importance. Electric railways hold much the same position that they have always held, due in part, no doubt, to the electrification of steam railways and the substitution of their load for that of occasional street-railway companies in process of abandonment. The domestic lighting revenue is not always distinguishable from domestic power. In spite of the rapid growth made by both sources, in recent years the latter has grown at the greater rate.

Telephone tolls are definitely gaining on telephone exchange revenue, becoming each year a larger part of the total revenue. If this change continues indefinitely its significance will be far-reaching. Tolls, arising as they do from commercial dealings, are in a class of their own and quite distinct from the exchange revenue. This distinction between the two has been broken occasionally in certain large metropolitan areas where the toll system of rates has been transferred to calls formerly handled on the flat monthly basis.

The public service industries are, then, definitely enlarging and extending the scope of their operations and are deriving revenue from ever-widening markets. The electric power and light industry is reaching into the lower grade of load which formerly was without any service.

SEASONAL VARIATIONS

Public utilities no less than practically every other class of industry are affected by the periodic changes brought on by the round of seasons. The revenue of both the electric and the telephone industries displays a distinct seasonal movement. Far from being uniform throughout the year, it is periodically higher in some months than in others.[2]

Electric Revenue. The movement of electric revenue (see chart) from the winter peak to the summer slump is so distinct that it leaves no doubt as to the extent of the climatic influence. Revenue reaches the highest point of the year in January when it is 114 per cent of the average, from which it declines to 90 per cent in July and August, advancing again in the Fall.

It is quite obvious that so much of the electric revenue as is derived from lighting will vary from summer to winter as the hours of daylight change. This applies to all types of lighting—the domestic, the commercial, and municipal street lighting.

Other classes of revenue vary in similar fashion. Street and interurban railways have heavier demands for current during the winter months, both on account of heavier traffic which arises on account of inclement weather and also because of the greater use of electricity per car for winter lighting and heating. Revenue gradually falls off during the Spring to its summer low; in July and August it is only 90 per cent of the average. The upward swing is then resumed through the fall months until the January peak.

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[2] All seasonal movements have been measured by Person's link-relation method.

Telephone Revenue. Seasonal influences react somewhat differently in the case of telephones. Although revenue is high in the winter months as with the electric industry, it continues to be high through the early spring and does not show any considerable slump until the late summer. In addition to this longer seasonal swing, the short months of February and November show an irregular drop that is of relatively great importance; February falling to 97, the lowest point in the year, and November appearing noticeably low between the high levels of October and December.

Seasonal variation does not influence all classes of business to the same extent. In fact, the variation just described applies to total revenue only and is the resultant of opposite and diverse movements in each of the various classes. Electric lighting revenue by itself would cause a seasonal variation of far greater amplitude than is now displayed by total electric revenue. The opposite movement of revenue derived from power sales has checked the variations of the total by filling in the low summer trough while at the same time not adding to the winter peak. In the telephone industry likewise, tolls serve to offset the movements of exchange revenues. The peak of toll revenues occurs when exchange revenue is at its lowest. Although the seasonal variations are much wider than those of total or exchange revenue, the toll revenue class is less than one-third the total and consequently does not have quite enough weight to offset the exchange fluctuations.

The variations in revenue arising out of the changing seasons is held to a minimum by still another factor, namely, the peculiar type of rate structure under which the revenues are derived. In the first place, the system of the flat monthly charge makes for absolute uniformity during all months of the year. Most classes of telephone service, particularly, are charged for on this basis, the charge being as high in summer as in winter, and hence not being subject to the seasonal variations affecting the use of the service. Electric rates are flat and inflexible to the extent that demand charges and minimum charges make them so. In addition, the block rates hold revenue fluctuations far below the variations in amount of service furnished.

Differences in Seasonal Variations. Fluctuations of revenue with any company or single operating territory are invariably larger than those for the entire United States. Over the entire country a variety of seasonal influences are at work, the peaks of some offsetting the low points of others. In the South, some telephone lines experience greatest activity at the time of year just opposite those in the north. This is particularly true of companies serving the resort sections. Their activity may or may not coincide with the movements found in the industrial areas.

Electric companies in the Denver and Rocky Mountain region tend toward a heavier summer activity than is found in other sections. This may be attributed for the most part to the large hydro developments which reach their peak with the spring and summer flow of hydro power. While it is obvious that so much of the electric revenue as is derived from lighting will vary from summer to winter as the hours of daylight change, the characteristics of the industrial load are not so predictable. Depending on local conditions, the greater part of them reach their peak in the summer and this counteracts the drop in lighting.

One of the advantages possessed by the holding company is its capacity to diversify its territory and its properties in order to take advantage of these counteracting seasonal variations.

Business Influence on Revenue

Business influences as well as the seasons cause wider fluctuations in electric than in telephone revenue. In fact, the telephone industry, on the whole, feels the influence of general business conditions very little, for only a portion of the service is devoted to business use. A large part remains purely residential and is much less affected by shifting business conditions. And even though demand for the service does fluctuate, the preponderance of flat rates reduces the effect on revenue to a minimum. But further, even the business use of telephone service is for the most part susceptible to only the larger fluctuations. Telephone service has become more or less essential in business operations regardless of the prevailing state of trade.

Electric Revenue. The electric industry feels the changes of prosperity and depression somewhat more extensively. Major movements of general business may be clearly traced in total kilowatt-hour output and revenue. In fact, the movement is so similar that electric production is frequently used as an index of business conditions. Fluctuating use of the service is reflected in the revenue.

There are several fundamental conditions which contribute to this larger movement of electric revenue. In the first place, the use of industrial power is especially susceptible to the state of trade. The power load of factories and shops follows industrial conditions very closely, increasing with prosperity and falling off during depressions. Secondly, the rate-schedules are more conducive to changes in revenue. The flat monthly rate is rarely used. Demand charges and minimum bills reduce the fluctuations, it is true, but the energy charge is levied directly on the metered consumption of electric energy. It allows a considerable range of variation.

As a result of these conditions the average fluctuations of electric earnings are roughly three times as wide as those found in telephone revenue.[3] However, the fluctuation is small in either case, 1 per cent in telephone and 3 per cent in electric revenue. Thus the business influence is wholly secondary in amplitude to the seasonal variation.

But the business influence is not found to be alike in all classes of revenue any more than was seasonal variation. Electric lighting earnings are comparatively stable, even those receipts from commercial illumination and display. Street and electric railway power revenue continues at a rather uniform level regardless of business conditions. Industrial power, on the other hand, fluctuates the most widely of all classes of revenue,—practically as extensively as the fluctuations felt by the industries which it serves. Revenue derived from domestic consumers, however, whether for lighting or power is affected less by these fluctuations.

Telephone Revenue. An even greater contrast is found in the classes of telephone revenue. Exchange revenue oscillates practically none at all while tolls reflect the cycle conditions in almost the same degree that total electric revenue does.

It may safely be said that the dominant influence of exchange revenue explains why the total is so stable, for tolls would by themselves inject a large cyclical influence into total revenue. Several factors contribute to the greater fluctuation of tolls: (1) the large proportion that arises from commerce and business, and (2) the prevalent use of a measured per-call basis of charges.

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[3] When measured in terms of standard deviation from normal, corrected for seasonal variation.

The chart indicates how clearly tolls respond to general business conditions. They reflect almost perfectly the major swings of the business cycle and somewhat less clearly, in spite of their unsmoothed irregularities, some of the minor crests and hollows. As is true of general business, toll fluctuations have not been so large in the last few years as during the post-war readjustments of business.

In practically every respect, then, this class of revenue is distinct from the exchange and from total revenue. Seasonal variations are wider and occur at different times of the year. The effect of business conditions is more marked.

In order to indicate the extent to which public utility revenue and production fluctuate in accord with business conditions, the following table has been drawn up. The average fluctuation over the period of 1920-1927, or from 1914-1924, as indicated in each series, is expressed in terms of standard deviations from normal, and while the difficulty of making an accurate comparison must be recognized, this affords, nevertheless, a handy means of comparison.[4]

The business influence in these utility series is smaller than in the non-utility enterprises. At the same time it is decidedly less pronounced than the seasonal movement. Total telephone revenue fluctuates by only 1 per cent after the elimination of seasonal variations.

Tolls fluctuate almost 3 times as widely, having a standard deviation of 2.5 per cent. Electric revenue fluctuates about 3.9 per cent which is less than electric production and less than the holding company revenue.

Electric revenue fluctuates also less widely than production in the case of each of two large electric companies for which data are readily available. The output of electrical energy is more liable to fluctuate than the revenue. Then, too, the fluctuations of the industrial and commercial power sales are far wider than those for the total of power and lighting together. Industrial power revenue varied from 1 per cent to 3 per cent more than the total revenue from all sources, while production varied considerably more.

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[4] They cover a period which is hardly homogeneous, including as it does the war or post-war with its violent oscillations and a developmental period of the industry. Nor were the irregular movements eliminated before calculation of the standard deviations.

SUMMARY—THE CHANGING STABILITY OF THE PUBLIC SERVICE INDUSTRIES

It is true that the public service industries are relatively free from the influence of business conditions, but some of the public service industries are more free than others. Thus total telephone revenue reflects in only a minor degree all those fluctuations which are found to exist in far wider amplitude in the electric revenues. It is equally important to note that certain classes of revenue are affected more than others, notably telephone tolls and electric industrial power.

In spite of the factors making for stability, the public service industries are undergoing a development whose natural result will be a narrowing of the distinction separating them from the non-utility industries.

Insufficient attention has been directed to these changes. The unstable classes of revenue are expanding most rapidly. Telephone

TABLE 92

BUSINESS FLUCTUATIONS IN PUBLIC UTILITY PRODUCTION AND REVENUE

SERIES		PER CENT DEVIATION
Telephone operating revenue in the United States:	1920–1927	.97
Telephone toll revenue " " " "	" "	2.45
Electric operating revenue " " " "	" "	2.98
Electric production " " " "	" "	5.13
Revenue of public utility holding companies:[a]	" "	3.90
A large Eastern electric company:	1914–1924[a]	
Operating revenue		3.85
Production		4.72
Industrial power revenue		4.75
Industrial production		7.64
Operating expense		8.04
Consumers		2.42
Industrial consumers		2.53
Another large electric company:	1914–1924[b]	
Operating revenue		4.06
Production		5.90
Industrial revenue		6.93
Consumers		5.19

[a] Gross earnings of public utility enterprises exclusive of telephone and telegraph companies as reported to the Department of Commerce by 95 companies or systems operating gas, electric, traction and water companies and comprising practically all the important organizations in the United States.

[b] Patton and Gressen's "Influence of Business Cycles on Utility Operations," *Journal of Land and Public Utility Economics,* II (1926), 40.

Chart 83—Fluctuation of Toll Revenue with the Business Cycle.

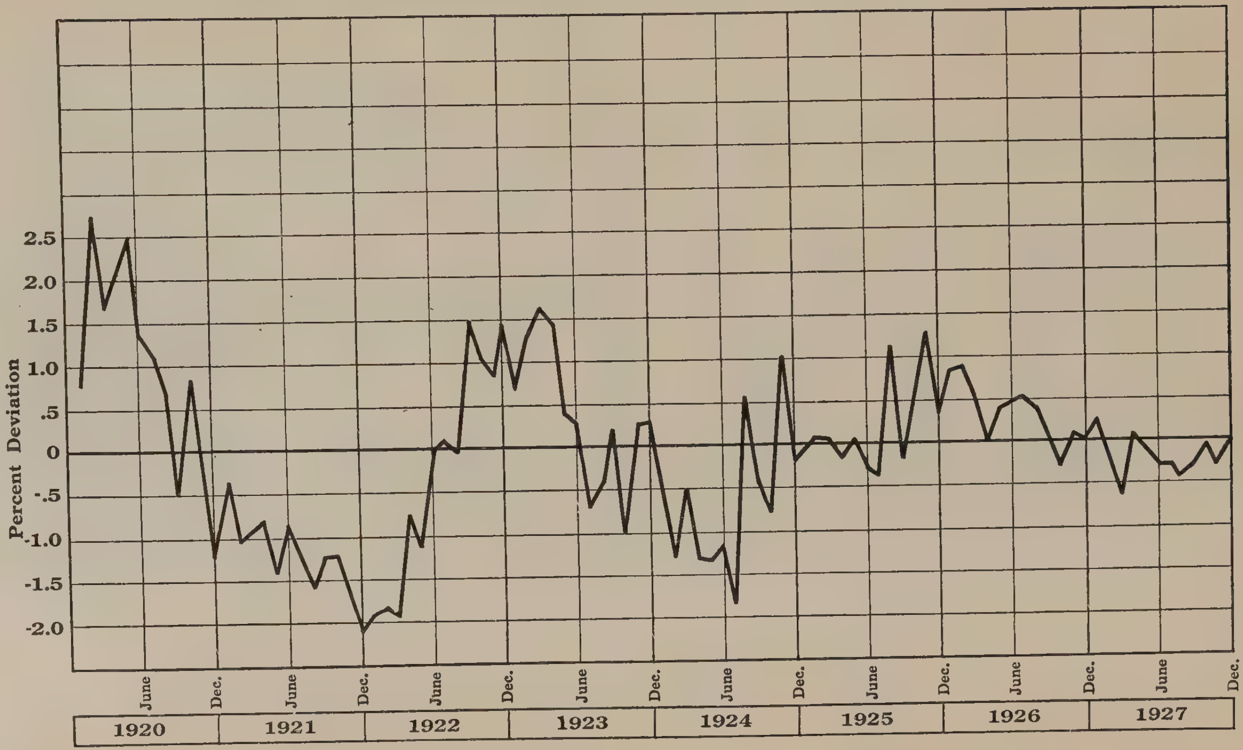

TABLE 93

Revenue and Production in the Electric Light and Power Industry *

1921–1927

	1927 [a]	1926	1925	1924	1923	1922	1921
Revenue—Total Operating (in millions of dollars)....	1,783	1,652	1,480	1,354	1,269	1,072	944
Lighting Revenue	1,075	1,018	979	902	795	657	570
Power Revenue	517	461	367	321	358	303	267
Electric Railway Revenue........................	60	58	53	54	52	50	44
Sales of Other Utilities.........................	129	115	80	76	64	61	61
Total Energy Generated (in billions of kilowatt-hours)	76	70	62	55	52	44	37
Lighting Consumption	16	15	13	12	11	9	8
Power Consumption	38	35	30	25	24	20	17
Electric Railway	7	6	6	6	6	5	4
Line Losses [b]	14	13	12	10	9	8	7

[a] Estimated on basis of 10 months' operations.
[b] Includes power used in intra-company operations.

* Source of data—*Electrical World*, XCI (Jan. 7, 1928), 32.

TABLE 94

TELEPHONE OPERATING REVENUE CLASSIFIED BY SIZE OF COMPANY: 1920–1926 *

(In thousands of dollars)

YEAR	TOTAL		CLASS A		CLASS B		CLASS C	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
1920	530,348	100	486,426	91.71	24,669	4.65	19,252	3.63
1921	582,723	100	541,462	92.92	21,685	3.72	19,575	3.36
1922	634,133	100	591,146	93.22	23,205	3.64	19,781	3.12
1923	671,435	100	647,112	96.38	15,884	2.36	8,438	1.26
1924	729,826	100	705,281	96.64	16,049	2.20	8,495	1.16
1925	818,218	100	792,428	96.85	17,047	2.08	8,742	1.07
1926	907,563	100	879,027	97.00	18,735	2.20	9,800	.80

* Source—Interstate Commerce Commission—Bureau of Statistics—"Selected items from annual reports of telephone companies."

TABLE 95

EXCHANGE REVENUE OF CLASS A TELEPHONE COMPANIES, BY SOURCE: 1915–1926 *

(In thousands of dollars)

YEAR	TOTAL EXCHANGE REVENUE	SUBSCRIBERS STATION REVENUE	PUBLIC PAY STATION REVENUE	MISC. REVENUE	PER CENT OF TOTAL			
					Total	Subscribers Station	Public Pay Station	Misc.
1915	184,684	169,725	12,418	2,539	100	92.0	6.7	1.3
1919	280,772	256,735	19,990	4,046	100	91.5	7.1	1.4
1922	409,598	378,714	25,854	5,029	100	92.5	6.3	1.2
1926	599,830	554,475	38,752	6,602	100	92.5	6.5	1.0

* Interstate Commerce Commission—"Summary of monthly reports of large telephone companies," 1915-1926.

TABLE 96

TOTAL OPERATING REVENUE OF CLASS A TELEPHONE COMPANIES, BY SOURCE: 1915–1927 *

(In thousands of dollars)

YEAR	TOTAL REVENUE	EXCHANGE REVENUE	TOLL REVENUE	MISC. REVENUE	PER CENT OF TOTAL		
					Exchange	Toll	Misc.
1915	253,751	184,684	66,339	2,727	72.7	26.0	1.3
1916	283,174	203,150	76,773	3,250	71.6	27.0	1.4
1917	318,066	225,444	89,282	3,338	70.8	28.0	1.3
1918	343,461	240,213	99,213	4,034	70.0	28.8	1.2
1919	409,683	280,772	124,811	5,844	68.1	30.5	1.4
1920	488,943	332,289	149,597	7,056	68.0	30.6	1.4
1921	541,196	378,480	154,268	8,447	70.0	28.5	1.5
1922	590,716	409,598	171,063	10,054	69.4	29.0	1.6
1923	648,447	449,096	187,152	12,198	69.3	28.8	1.9
1924	705,177	491,981	199,259	13,935	69.7	28.3	2.0
1925	792,472	545,408	230,227	16,835	68.8	29.1	2.1
1926	880,907	599,830	261,324	19,227	68.2	29.6	2.2
1927	951,710	642,251	286,959	22,500	67.5	30.2	2.3

* Source—Interstate Commerce Commission—"Summary of monthly reports of large telephone companies," 1915-1927.

growth has occurred to possibly the greatest extent by the toll business. In the electric industry, total revenue is less steady than it was when lighting was the primary source. The power load is the principal class in which fluctuations make themselves manifest and is continually taking on more of these types of load which are highly subject to business fluctuations.

CHAPTER XVI

THE PRICE OF PUBLIC UTILITY SERVICES

166. Discrimination in Public Utility Rates *

While outright discrimination in the rates of public-service companies has long been prohibited both by common and statute law, there are a number of ways in which our public-utility rates are in effect discriminatory. Among the more important of these are, (1) free or preferential rates to cities and to public or quasi-public institutions of one sort or another, (2) contract rates with certain consumers, (3) by the simultaneous use of flat and metered rates, (4) through certain classifications of consumers, (5) by the use of certain types of rate schedules, (6) discrimination through inter-utility relationships, and (7) through conflicts in regulation itself.

In the early development of public utilities it was very common for cities in granting franchises to require that the city be given service at reduced rates, or even that it be given free service, for city buildings, public libraries, public schools, hospitals, churches, and eleemosynary institutions. Water companies were frequently asked to furnish water for drinking fountains, public parks, flushing of streets, and for fire protection without cost to the cities. Street-railway companies likewise have been required to furnish free transportation for policemen and firemen while they are on official duty. Free telephone service also has been demanded in some cases for all city offices. These types of free service have been the compensation or part of the compensation which cities have demanded for the use of city streets and the right of the public utility to carry on its business within the city. . . . In the State of Maine the plan of giving lower street-railway fares to school children appears to have had its origin in the policy of the railroads in that state granting such a concession. . . .

It ought to be appreciated that if a public utility serve a

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* Excerpts from C. O. Ruggles, *Journal of Political Economy*, XXXII (1924), 191-206.

city, public school, or other institutions at preferential rates or without cost, that the loss of revenue due to such a policy must be made up through the rates to private consumers. . . .

The California Railroad Commission at one time held that public utilities were within the law of that state in giving reduced rates or free service to the federal government, to the state government, or to the cities of the state. But this Commission's decisions in more recent years show that it has shifted its position on this question. In 1921 it maintained that if a public utility refused to raise its rates to a city, the utility itself should stand the loss, and not shift the burden to consumers generally.[1] In another instance this commission has ruled that it is unfair to require private consumers to bear the expense of fire-protection furnished to a city.[2]

In Indiana many franchises for a definite term of years had provided for free service to cities. When these franchises were surrendered by the public utilities for indeterminate permits, in accordance with legislation in 1917, the Indiana commission took the position that the free-service clauses of the old franchises, which were virtually contracts with the cities, should be followed for the period of the unexpired years of such franchises.[3] This decision of the commission was in accordance with an amendment to the legislation of 1917, which was passed in 1919, to the effect that free service to municipalities should continue during the time prescribed by the franchises which had been surrendered. But the Supreme Court of Indiana ruled otherwise. It held that the old franchises providing for free service, which had been surrendered for indeterminate permits, were no longer controlling in the relations between the cities and the utilities and that public utilities were not required to furnish service to cities without cost.[4] This court has also ruled that even though free service has been agreed upon as the compensation to a city for a franchise the state commission may nevertheless set this provision of the franchise aside.[5] In Pennsylvania the Public Service Commission may change franchise rates made by a city if it appears that the cost of rendering service to the city means that private consumers must make up the deficit in the utility's revenue.[6] In Oregon, while the law permits lower rates or free service to cities, the Public Service Commission in that state does not indorse the policy.[7]

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[1] *Re Western States Gas and Electric Company*, P.U.R. 1921-B 419.

[2] *Re Marysville Water Co.*, P.U.R. 1921-C 640.

[3] *Re Indiana General Service Company*, P.U.R. 1920-A 948.

[4] *Greenberg Water Co.* v. *Lewis*, 128 N.E. 103; P.U.R. 1921-A 96.

[5] *Winfield* v. *Public Service Commission*, 118 N.E. 531; P.U.R. 1918-B 747.

Contract rates with consumers are very similar to the franchise rates just discussed. Such rates sometimes give undue advantage to one consumer or class of consumers over others. Before the days of regulation of public-utility rates, such contracts were very common, and favored consumers were sometimes given service at less than actual cost. . . .

Contracts on rates between a consumer and a public utility cannot be looked upon as a contract between private parties. Contracts providing for rates which might be equitable at the time the contract was made might become very unfair with the passing of time. Whether rates become too low with changes in economic conditions, or were placed too low when the contract was made, the effect in either case is an unfair burden on other utility consumers. Fortunately there is little question concerning the legal right of regulating bodies to set aside contract rates which are found to be unfair.[8]

Looking at the problem of contract rates from the point of view of large consumers it is seen that such rates are necessary. Without contracts that provide rates which are equitable there would be no reason why very large consumers should not remain independent and provide service for themselves. This means that a contract providing a very low rate per kilowatt-hour for electricity would be justified if the consumers also paid proper service charges, and, in certain cases, demand charges. . . .

In the early history of public utilities it was the common rule to give unmetered service, and while metered service has been quite generally introduced there are too many instances even at the present time of unmetered service. Ordinarily, free service is unmetered service. The very fact that cities, institutions, and even certain individuals have unmetered service tends to encourage waste. . . . In considering rates for electric service the Montana commission recently observed that there had been three expansions of the plant and it raised the question whether the expansion to some degree had not been due to the wastefulness and inefficiency due to unmetered service. This commission maintained that there is no more sound reason why electricity should be sold in unknown quantities than there is for selling coal "so much a load."[9] . . . It would appear that the public ought to realize that unmetered rates foster inefficient operation, high operating costs, and hence higher rates for all.

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[6] The Pennsylvania Public Service Commission has held that a public utility in that state cannot be required, under the terms of a franchise or other contract even antedating the Public Service Company law, to continue to supply service free or at a reduced rate; nor can such a company make a binding contract with a municipality or an individual whereby its service will be furnished free or at a reduced rate. The decision of the Pennsylvania Supreme Court gives a basis for the Commission's interpretation of Pennsylvania laws—*City of Franklin* v. *United Natural Gas Co.*, P.U.R. 1920-B 800; see also *Ben Avon* v. *Ohio Valley Water Co.*, 4 P.C.R. 637, affirmed by the supreme court in 260 Pa., P.U.R. 1918-D 49, 103 Atl. 70; see also *Leiper* v. *Baltimore & P.R. Co.*, 262 Pa. 328.

[7] *Re Portland Railway, Light and Power Co.*, P.U.R. 1918-A 751, 764.

[8] See, for example, *Union Dry Goods Co.* v. *Public Service Commission of Ga.*, 248 U.S. 372; *United States Smelting, Refining and Milling Co.* v. *Utah Power and Light Co.* (Utah Supreme Court), 197 Pac. 902; P.U.R. 1921-B 837.

Classification of consumers, while at first very crude, has been carried out extensively in more recent years. One of the earliest classifications and one which is followed at present is that of business and residence consumers. Another is large and small industrial consumers. Some classifications divide users into old and new consumers. A personal basis for classification is seen in reduced or free service for the employees, officials, and even the stockholders of utility companies.

Any classification of consumers should rest upon a logical and equitable basis. For example, to divide electric-light consumers into business and residence consumers may be very unfair. There would be no justice in electric rates that were very much higher for residences than for business establishments unless there was sufficient difference in the amount of energy consumed to warrant such a division. . . . There is a sound basis for a classification of consumers into so-called long-hour and short-hour users, with a lower rate per kilowatt-hour for the former. Hence, classification into large and small industrial consumers can be justified if it is properly done.

A division of consumers solely on the basis of "old" and "new" consumers is unfair. The date on which a patron is taken over by a public utility company is not a fundamental basis for rate-making. Cities sometimes make low rates to new industries for water, for electric current, or other utility service; if the utility is not owned by the municipality, the stipulation is sometimes made in franchises granted to privately owned utilities that they shall give preferential rates to new industries in order to secure their establishment in the community. To single out the consumers of one or more utilities to bear the burden of free or preferential service to new industries is ob-

[9] *Re Electric Service and Rates at Eureka*, P.U.R. 1922-B 360, 364.

viously unfair. If the policy of subsidizing new industries is to be followed, there is no reason to believe that the consumers of a certain utility would profit more than would the population generally by the establishment of such industries.

Moreover, preferential rates to a manufacturing establishment in many of our cities could not be justified on the basis of a wholesale rate, for there are many large mercantile establishments, and in some instances even office buildings, that would use a greater quantity of service. To favor new industries, therefore, is to make the difference in rates on the basis of the use to which the public-utility service is put. There is no justification for such a discrimination.[10] . . .

What has been said does not mean that there might not be instances where it would be to the interests of consumers for a public utility to grant preferential rates to new industries or to foster the industrial development of a community provided the service is not rendered below cost, and if there appears to be a possibility that because of the economic development, and hence the greater volume of public utility business, the consumers generally can be served at lower rates than would be possible without the larger volume of business. . . .

Ordinarily, any special rate given should cover the actual out-of-pocket costs of rendering the service. If the management of a public utility has implicit faith that certain new lines of business can be developed, provided rates somewhat below the actual cost of rendering the service are granted at the outset, then its faith should be tested by its willingness to accept a reduced rate of return for a period. . . . Preferential rates by a power and water company for irrigation purposes might be justified by the development of an area served and thus by the ultimately lower rates both for electricity and water as a result of the economic development which would take place.

Discrimination through furnishing of service to the officers, stockholders, and employees of public utility companies without charge or at reduced rates has been very common in the United States. Sound public policy demands that any inadequacy in the remuneration of officials and employees of utility companies should be made up by an increase in salary or wages and that all service rendered to them should be metered and paid for at regular rates. The compensation of such persons and the amount of service they receive should be reflected in the accounts of the utility. . . .

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[10] In Missouri, a city which was anxious to encourage the development of manufacturing made a close bargain with a water company for a manufacturer's rate for water. The Missouri commission held that such a rate, not based upon the quantity of water used, was discriminatory.—*Hines* v. *Joplin Water Works Co.*, P.U.R. 1920-B 943. For another Missouri case, similar to the above, see P.U.R. 1917-B 576. The New Jersey Commission has held that a gas rate on the basis of the use is discriminatory, P.U.R. 1919-B 860.

The principle of allowing a lower rate on a larger consumption of utility service can be given sufficient recognition through the application of a ''block-rate'' principle. Under the block rate, for example, there would be, say, a rate of 80 cents per thousand cubic feet for gas for the first 10,000 cubic feet; for gas consumed between 10,000 and 20,000 cubic feet the rate could be 65 cents. Such discrimination rests on a sound economic basis and when allowed to all under the same circumstances should not be prohibited.

Another form of rate-schedule manipulation is found in the combination of the quantities of service consumed by one patron in different localities or at different installations, in order to give to such a consumer certain wholesale rates to which he ought not to be entitled. A good example of such a plan is that of allowing a number of school-houses within a district to combine the quantities of electric current used by them all in order to get a lower rate. The different plants of a manufacturing business are sometimes furnished electric current in such a manner that it is unjust discrimination to allow a combination of the readings of different installations. Combinations of the meter readings for water at several different stations by a railroad company would give to it a lower rate on its total consumption than it would deserve.

It may be objected that proper rate classification cannot be made without undue cost. Differentiation can be carried out in rate schedules within reasonable limits without exact mathematical apportionment of costs of classes of service to individual consumers. Simplicity in rate schedules is much to be desired so long as schedules are equitable and non-discriminatory. Any deviation in rates should maintain a logical relationship between the conditions and the rate. Or stated another way, variations in rates should be based upon some essential dissimilarity.

Sometimes consumers own a part of the equipment which is employed in giving them service. Such a plan, in some cases, merely provides a pretext for unfair rates. If conditions demand that consumers furnish a part of the facilities which are necessary to establish a public utility in business, provision should be made for a rental of the property owned by the customer. . . .

The development of large-scale production and distribution of public utility service has brought into the foreground three types of discrimination that are somewhat difficult to cope with. One of these is found when the users of one kind of utility service make up the deficit which may be incurred in furnishing some other kind of utility service. Another is the discrimination against one utility company by another either in complementary or in competitive service. The third is the discrimination against localities which results from the rates which may be charged by a big public utility company operating in many different cities and rural districts.

There are distinct advantages in having one large utility company furnish several different kinds of service. For example, a street-railway company can effect substantial economies by furnishing to the community it serves current for both light and power.[11] But its accounts may not be accurate, or they may be manipulated so that it is not possible to determine whether each of these services is paying for itself. In recent years it is probably true that in many instances deficits in the street-railway business have been balanced by revenue from the sale of electricity for light and power. Sometimes a public utility company will give a very low rate on heat in order to develop that phase of its business. The company calculates that it is good business to accept a loss on this part of its business and make up the deficit on some other part of its service.

When service is rendered at a loss, there should be some broad economic or social basis for such a policy. As has been suggested, a public utility company would be justified in making a rate for some class of service so low that there would be temporary loss, provided continuation of such service would ultimately enable the utility to recoup its losses without putting a burden on other classes of consumers. A community might be justified in giving a very low rate on water so as to encourage its use on sanitary grounds. But unless such discrimination can be justified on broad economic or social grounds it ought not be permitted.[12]

An interesting example of one big public utility company discriminating against another is seen in the attempt on the part of the Western Union Telegraph Company to refuse to grant credit to the Postal Telegraph Company after having extended credit to the Postal for a period of thirty years and while granting credit to other consumers no more financially responsible.[13]

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[11] See "Problems in the Development of a Super-Power System," by the writer, in *Harvard Business Review*, II (January, 1924), 160-173.

[12] For an interesting case see *Re Pacific Gas and Electric Co.* (California), P.U.R. 1920-E 597.

Through intercorporate relationships an unfair advantage is sometimes taken of a distributing company by a producing company, or sometimes by a holding company, which controls all relations between producing and distributing companies. This frequently means that a public utility in one locality is dealing at arm's length with the company from which it receives some utility service. In this way a certain locality may be called upon to pay more than a fair rate for utility service because the local utility has been required to pay an increased rate for service to a producing company.

An interesting case involving discrimination against a local public utility company and in turn against the locality served by it arose a few years ago in one of the southern states. A local public utility had been generating its own electricity by a local steam plant. A big public utility organization built a transmission line into the locality and induced the local company to discontinue its steam plant and sign a contract to purchase its electrical energy. This, of course, made the locality dependent upon the big power company for current, and when the contract expired the power company refused to sell any more current except at a very substantial increase in rates, and at rates very much higher than were being charged to many other localities. The supreme court of the state involved decided that a power company which had dedicated its property to public use could not arbitrarily select the consumers whom it would serve, and that charges in the various localities for similar service should be equal; also that this obligation could not be evaded even though the consumer might be to some extent a competitor.[14] . . . The common-law rule applying to discrimination against individuals does not cover this newer form of discrimination in public-utility rates against localities. Legislation in the future should, therefore, include ''localities'' in the anti-discrimination provisions.[15]

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[13] For a period of about thirty years the Western Union had granted credit to the Postal Telegraph Company. After the United States government turned back the telegraph systems to their owners, the Postal Telegraph immediately reduced its rates 20 per cent to the pre-war level. The Western Union did not reduce its rates and it also refused credit to the Postal. Facts disclosed that 70 per cent of the Western Union's business was done on credit, and that probably its most important business was thus carried on. The second District Commission of the state of New York held that such discrimination against the Postal Telegraph Company was not justified. See *Postal Telegraph Cable Co.* v. *Western Union Telegraph Co.*, P.U.R. 1920-A 683. For a later case which came before the New York Supreme Court in which the court held that the Postal Company might not grant credit to a consumer for whom some Western Union service was to be rendered, if the Western Union itself had refused credit to said consumer. New York Supreme Court, Appellant Division, Third Department, *People Ex. Rel. Western Union Telegraph Co.* v. *Public Service Commission*, Second District, 192 App. Division 748; 183 N.Y. Supp. 659; P.U.R. 1920-F 630, 642.

With the distribution of utility service over wide areas the discrimination which occurs among different localities or even between states is sometimes a serious problem. For example, one city, by crowding down rates, makes it necessary for a public utility to keep rates higher than would be fair in another city in order that it may receive a fair return on the aggregate of its business. Franchise taxes on gross receipts in one community and not in another may produce the same result.[16] Heavy obligations on an interurban railway for paving in one city may mean that car-riders in other cities are required to help pay the costs of paving the streets of a city in which they do not live.[17] Obviously the same condition presents itself as a result of conflicting or ill-advised state legislation. . . .

This discussion indicates, that there is much danger that there will be to an interesting extent unfair discrimination in the regulation by cities themselves of rates, of service, or of both. The evidence shows also that there is need for more careful regulation of intercorporate relationships in both intrastate and interstate utility service. There ought to be effective control over holding companies which in turn have control over the local utilities, if discrimination against localities is to be eliminated. As our utilities serve larger areas it will be imperative that provision be made against discrimination by the states themselves in their regulation of what is, in effect, interstate utility service. . . .

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[14] This is a case in North Carolina of *Salisbury and Spencer Railway Co. et al.* v. *Southern Power Co.*, 179 N.C. 18, P.U.R. 1920-C 688, and 102 S.E. 625, P.U.R. 1920-D 560.

[15] That this need is already appreciated in some states may be seen from the laws of Illinois, 1913, p. 479, sec. 38.

[16] The California commission has held, in a gas-rate case, that a city with a tax on gross revenue of a public utility shall place the burden on its own population, and not upon the customers of the whole field served by the utility. See *Re Southern California Gas Co.*, P.U.R., 1922, A, 277, 282.

[17] In some states there has been a demand in recent years for the abolition of state utility commissions and the substitution instead of municipal home rule. The consumers of utility service would suffer under such a change. The writer has pointed out in another connection (*Harvard Business Review*, January, 1924) that the large-scale production and distribution of utility service now makes it impossible for any one city to attempt control over a company which is at the same time serving scores of other cities. This is especially true of the light and power utilities.

Both the public and the utilities would profit by extending regulation to include a constructive and comprehensive study of rates. It is only on the basis of such a study that discrimination in rates can be justified or eliminated. In other words, such a continuous study of rates should have two important results. It should enable regulating bodies to know whether the rates which they approve are equitable and it should serve to educate the public on what constitutes justifiable discrimination in rates.

167. A Theory of Telephone Rates *

The general principles which should govern the fixing of telephone rates may be summarized as follows. The total of the rates charged must be high enough to yield sufficient revenue to meet the total costs, but should not be in excess of this amount. The rates for the particular services must cover at least the added costs which the service occasions, and should contribute as much to the joint costs as the demand for the service will permit. . . .

Although a subscriber may not be willing to pay the full costs added by connecting him to the central office, it is still desirable that he be given service, if he adds enough value to the service of other subscribers to make them willing to pay at least the portion of the added cost which he will not pay. The cost of a particular service may equitably be collected from those who benefit by the giving of that service in the proportion in which the benefits are received. In this connection it should be remembered that the benefit received by other subscribers from a particular telephone is a result not only of being able to call that telephone, but also arises from the receipt of calls from it. That is, a call which terminates with a subscriber may have as much value to him as one which he originates.

We frequently hear that the justification for using rates based on the relative value of the service is the remarkable development of telephone service that this practice has brought about, and there is considerable truth in this argument. Since the value of telephone service increases with the number of subscribers up to a certain point, to have a large development of the service is desir-

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* Excerpt from article by Barclay J. Sickler, *Journal of Land and Public Utility Economics*, IV (1928), 180-184.

able. Both from the standpoint of society as well as of the individual telephone users, it is economically beneficial that telephone service be extended to the point where a utility that is evaluated at a sum at least as great as the amount which it costs to supply that telephone, is received both by the possessor of the last telephone added and by those who wish to call him or be called by him. A policy which tends to bring this about must also be economically desirable.

Application of the Theory. The question is how to charge each telephone user his full added expense and still distribute the common costs on the basis of the value of the service. Before this can be done it is necessary to consider just what is included in the added cost of serving a subscriber. If telephone systems are considered in the same light as transportation systems, as units which must be provided to give the community the required communication service, it might be said that a telephone in every home, store, office, or factory which an appreciable number of persons might want to call would be necessary to meet the needs of the community as a whole. At any rate, the great majority of the telephones now installed would have to be maintained to give the subscribers as a whole the service which they desire, whether the possessors of these telephones want them or not. If this view of the telephone utility be accepted, then it appears that the only added ''out-of-pocket'' cost of serving the possessor of any one telephone would be the cost of connecting this subscriber to those who would not otherwise wish to call or be called by him.

The Readiness-to-Serve Rate. Three major factors are frequently cited with which the costs of providing public services vary. A classification of costs on the basis of these variables may be made as follows: (1) those costs dependent upon the mere provision of the plant in readiness to serve; (2) those dependent on the giving of service to the customers, but independent of the amount given; (3) those dependent on the amount of service given.

In the telephone industry the first class of costs may be divided into two parts: (a) those that depend upon the number of customers, and (b) those that depend on the busy-hour load. The first division includes chiefly the costs of providing the subscriber's instrument, the equipment connecting him to the central office, and part of the central office equipment. The second division includes chiefly the costs of furnishing and maintaining trunking equipment.

The second class, customer costs, depends upon the number of subscribers. It consists largely of expenses of collection and record-keeping. The third class of costs depends upon the number of calls made, and includes chiefly operators' wages and other central office expenses.

Two or three-part rates are possible in the telephone industry on much the same basis as they have been developed in the electric industry. The result of such rates is to charge each customer in accordance with the amount of expense caused by each of the three factors which arise as a result of serving him. Such a method of charging could be made into a two-part rate, consisting of a service charge including the costs dependent upon the peak load and upon the number of customers and a small charge for each call. This rate would be similar to the existing measured service rate, save that no calls would be included in the service charge, and the charge for each call would be lower. There would seem to be no more difficulties involved in the administration of such a rate than in the regular measured rate.

By the use of this rate the costs could be charged in accordance with the factors producing them, thereby insuring that no one is charged for costs incurred for the benefit of some one else. By having such subscriber pay for the costs according to the manner in which he occasions them, economic waste is prevented also. If he may cause costs to arise without immediately being charged for them, he is more likely to be reckless about causing them than when his charge directly reflects the increased cost resulting from his actions.

This system of charging may be regarded as a method of preventing the added costs of serving a subscriber from being allocated on the basis of value of the service as well as the joint costs. The last two classes of costs, customer and output costs, are to a considerable extent, although not wholly, added costs of serving a subscriber. If any one subscriber were not served, the greater portion of these costs chargeable to him would cease. They should thus be charged to each subscriber on the basis of the actual expense. The fixed charges which do not vary with the amount of service given are almost entirely in the first class, readiness-to-serve costs, and should therefore be allocated on the basis of the relative value of the service. Charging on the basis suggested would make possible considerably greater accuracy in doing this than under existing rates.

Aside from reducing arbitrary discrimination, the advantages to the telephone utility and to the customers from such a system of charging would arise from the greater development of service which would result, not extensively but intensively. If customers paid the larger portion of their costs in one lump sum, and added calls were possible for one or two cents apiece, the incentive to make more calls would be great. The more calls made, the less would be the average cost. Customers would have a substantial overhead cost and they would derive advantage from using it as efficiently as possible. This would be particularly true where machine switching is used. Those costs directly dependent upon the number of calls are much reduced under this type of switching; a greater portion of the costs being fixed in character. A more intensive use of this fixed equipment is obviously desirable from the point of view of society, and up to a certain point would result in more value for the telephone user and more revenue for the telephone company.

The desirability of a more intensive use of the existing facilities cannot be doubted. One of the most serious charges against measured service has been that it unduly restricts use of the service. The principal reason why it has done this to an undesirable extent is because it has not taken the form of the rate proposed. Instead of charging for each call only the amount of expense caused by that call, a larger amount has been charged. Thus the restriction in calls has been undesirable, for a larger sum and consequently a larger subjective value is lost by each call not made, than is saved in expense. Under the rate proposed the charge per call would just cover the cost of that call, and additional calls would be made until the satisfaction received was just equal to the cost of providing it. Society would gain from the remaining restriction on calls because additional calls would yield less satisfaction than they would cost, and no material disadvantage to the telephone company would exist because no gain over costs would result from additional calls.

Where the variation in the number of calls is slight, this type of rate would be almost the same as the flat rate. With a smaller charge per call the cost of measuring the service might become more burdensome in many classes of service than the disutility arising from the inequity of the flat rate. If this is true, the flat rate is the desirable one for this service. Where there is but little variation in use between subscribers, the flat rate is not inequitable, and is cheaper. Measured service is desirable only where the added cost and inconvenience involves less disutility than the discrimination of the flat rate.

Two major objections will probably be raised to such a proposal as this. The one most likely to be raised by telephone men will be that a large amount of customer ill will would be aroused. This same objection was raised by the electric service industries to the proposal to charge a scientific rate for electricity and is now being raised by the gas industry. The electric utility found that after a period of customer-education the expected ill will did not materialize. The same thing may be expected both in the gas and in the telephone industries were they to carry on an educational campaign, such as was carried on by the electric utilities. Probably it would be necessary to provide an optional rate for a considerable period, but if the system has merit the majority of the customers would eventually support it. As a method of ''sugar-coating'' the pill, some calls might be included in the service charge. If no more calls were allowed without extra charge than the great majority of subscribers are almost sure to make, no very undesirable results would follow. On the other hand, as many calls as the majority of the subscribers use should be included, in order to make the average cost of the number of calls included as low as possible. In this way the greatest benefit would be obtained from the ''sugar-coating'' process.

The second argument likely to be raised is that the price to small users would increase. There is no reason why this should occur. Rates would still be set on the basis of value of the service, and if the value remained the same to each class all users would pay the same amounts as now, the difference being that it would be paid in the same manner as the costs are incurred. That is, the greater portion would be paid regardless of the amount of service given. However, the increased use of all telephones would particularly benefit business users, and the share of the common costs which business stations would be willing to carry would probably rise. This would enable a lower rate to small users, and would probably result in a more extensive development among such users than now exists.

Where rates containing a service charge which did not include any calls have been proposed in the past, they have usually involved an increase in residence rates and a decrease in business rates. However, this is attributable to the methods of cost allocation used. The designers of these rates have been burdened by the idea that costs could be allocated on some other basis than value of the service. Had the principle of value-of-the-service been followed it is very unlikely that these readiness-to-serve rates would have increased the price to small users.

168. Street-Railway Rates With Special Reference to Differentiation *

The rate-making problem is fundamentally the same for street-railways and for steam roads. In each case we must recognize the presence of differential charges and provide for their equitable distribution. . . .

A differential is one of a system or schedule of quantitative differences graded according to some principle not determined by the intrinsic qualities of the things differentially treated. But varying differentials that are adjusted in detail but roughly and according to convenience may produce external uniformity of price, *i.e.* a differential distribution of fixed charges may complement and equalize variations in prime cost. The lower limit beyond which the reduction of a rate by differentiation cannot economically go is the separable cost, or prime cost, of the particular good or service. For steam roads this as a rule is considerably less than a proportionate share of operating expenses; *i.e.* some of these, as well as most capital charges, do not vary with the volume of business. Prime cost varies with conditions and circumstances, while reliability and stability in rates are necessary in order that business may adapt itself to them, hence only average adjustments of rates to prime cost are practicable.

A lateral limitation upon differentiation is constituted by the moral feelings of the public, which insists that the same price be charged for the same commodity under the same conditions, *i.e.* without distinction of persons. This is another reason for simplicity and stability of rates.

Total cost per unit of business cannot be the rule for price or rate-making. Total unit cost is itself reduced by additional business, hence the rate should be determined with reference to this possible variation.

Economy—the performance of the greatest service at least cost—is at the foundation of the differential system; the monopoly has facilitated its development and application. . . .

The practice and precedent of steam railroads are altogether in favor of differential rates, the differentiation having no direct relation to ''total'' cost, and depending on a difference in the kind of traffic only so far as that difference may be connected with difference in ability to pay and also because external differences in traffic are naturally a great facility in classification. This differentiation of rates has been a development due entirely to the initiative of the railroads themselves. And the extent to which the development has been carried in the United States, though not without its inconvenience and embarrassments to the public, is one of the most important respects in which American railroads show their greater progressiveness over those of other countries where the development of commerce has been hampered by a failure to carry the application of the principle so far. . . .

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* Excerpts G. P. Watkins, *The Quarterly Journal of Economics*, XXV (August, 1911), 623-649.

In one respect it is obvious that the flat rate is quite on all fours with the principle of charging what the traffic will bear. There is absolutely no attempt to make the charge conform in detail to the character of each particular service or class of service. The charge for an individual service is not based upon a calculation of its individual cost, and there is no direct relation between the two. If there were no other resemblance between the developments in the two situations, this fact of itself would indicate that their economic foundations are the same. But let us see why it is that in this country the nickel street-railway fare is seldom substantially departed from, regardless of the character of the service rendered. . . .

The economic essence of the differential principle is, not that prices are different for similar services, but that, for two services substantially similar and therefore ''costing'' about the same amount, one is made to contribute to fixed charges and profits only (say) 10 per cent above prime cost, while the other contributes 50 per cent. The result is that the price in the two cases is as 11 to 15, that is, there is a difference in price. But this difference is merely an incidental result of the principle involved, and by no means essential. If the one service costs 5 and the other 7½, but both are performed for a price of 10, the differential charge is there; since the net return is 100 per cent in addition to prime cost in the one case and but 33 per cent in the other. Here the result of the differential charge is uniformity of price. In this illustrative case the uniformity is merely an accidental result; it is not in general wrong to think of the differential principle as causing differences in prices.

In the case of street-railways the uniformity of the charge is no accident. True, the scope of the operations of the differential principle is restricted. It is not free to produce the remarkable effects that it sometimes does in steam-railroad charges. But passengers are, nevertheless, in a sense, differentially treated, by very reason of the fact that the rate for all is a nickel.

Business on a given line during certain hours of the day may not be sufficient to justify the running of more than a minimum schedule of cars. There is a certain minimum frequency of street-car service—doubtless varying from city to city—which the public will require. The necessity of giving employees something like a full day's work also causes unfilled cars to be kept running at slack hours. Under such circumstances, new passengers riding on one of the cars gathering few passengers cost the company practically nothing. Here a nickel may be considered to be entirely net return. On some other line of the company the traffic is probably dense enough all day long to warrant the operation of more than a minimum schedule. Here added passengers will cause the addition of cars and a car load of passengers must be taxed with the operating expenses of the car before we get a net portion of each nickel. In the rush-hour period the same principle applies, with a modification. Since the rush hour is the period of maximum loading, if cars are supplied in proportion to passengers at that time, the supply of equipment must increase to a point where some of it is used for rush-hour passengers only. In this case some of the interest and depreciation of equipment is prime cost. In other words, the rush-hour variable cost, or prime cost, per car load of business (assuming the car load to be a constant quantity) is greater than at any other time. If the car load remains the same, the margin above prime cost from each nickel will be much reduced. In practice the situation is met by increasing the load, so that the number of nickels per car trip is great enough to more than overbalance the increased prime cost per car load. In this way the rush-hour business is possibly the most profitable business of street-railway companies. As regards the passenger riding against the current in the rush hour, however, the prime cost of carriage is again practically nil. There is plenty of differentiation in the system of street-railway charges, though the expression of the principle is not the same as with steam roads.

So far as practice knows an opposite, the nearest to the true opposite of the differential system of rates is the zone system, according to which the charge made is modified according to distance transversed. But even in this case, so antithetical are railroad rates to adjustment on the basis of cost, the approximation to a total-cost system is very remote.

Regard for total cost per unit should take account of the density of traffic on different lines, as well as distance traveled. But this, so far as the writer knows, has not been attempted. The flat-rate system, by being *more flat* than the zone system, only comes much nearer to being an adequate expression of the economic factors which produce the manifestly differential system of steam roads. The practice of charging the same or approximately the same rate for the long haul and for the short haul included within it is a phase of the differential system of the steam roads. There is an evident and essential similarity between this and the flat-rate system of the street-railways.

Whether the term differential should be applied to the relation of the flat nickel rate to the contributions to profits made by different classes of passengers, may perhaps be questioned. That is a matter of terminology. The conception of a differential return to land as the foundation of the theory of economic rent is older than are the railroads. The differential return here is a result of uniformity of price for products of varying cost; thus the situation is entirely analogous to the differential contributions of street-railway passengers to profits. It would appear, therefore, that differentials are a part of the street-railway flat-rate system as much as of the steam-railroad system of classification of freight and passengers. . . .

The absence of causal relation between the total cost of the particular item of street-railway service and the price paid for it is still the essence of the situation, but the differential element in the price charged results from it, instead of in detail determining it. The flat rate can therefore be maintained only by the inclusion of business on which the margin of net return in the nickel is large along with that in which it is small,—the fat with the lean. This situation is of the essence of the flat-rate principle, that it covers both the relatively profitable and the relatively or absolutely unprofitable business, and that the one shall make up for the other and the other be balanced by the one. The Post Office sustains itself on a flat-rate system of charges maintained in just this way.

The "fat" is composed of the short rides taken within the business center; the home-to-work traffic is the complementary "lean." Both because of the time of day when it occurs and because of its balanced character, the inner-city traffic is highly advantageous to the railway that serves it. But its amount depends upon the volume of daily traffic to and from the business center. There is a natural connection between these two. They should therefore go to the same company in order that the high differential return from the one may compensate for the high prime cost of the other. Consolidation of street-railways thus not only facilitates the rational development of a transfer system but it also approximately unites fat and lean.

We have mentioned some of the peculiarities of the economic status of branch railroads. When there is no pretense of paying according to distance traveled, as is the case with the American street-railways, it is obvious that an extension or branch, if it does not pay directly, cannot pay through carrying passengers to a main line where they ride a long distance. The nickel pays for the entire ride, and the longer it is the more it costs the company. But there is another way in which extensions that are not profitable according to their showing as treated separately, may nevertheless pay indirectly. A city street-railway system is interested in the development of its business center. The development of the business center is dependent upon the growth of a tributary population, and this involves the development of outlying residence districts. The development of outlying residence districts depends upon the building of extensions. The business man who comes to town in the morning will perhaps spend two nickels for short rides in the business section. And his wife shopping in the afternoon may spend two more. The only way such profitable business in the center of the town can be made to grow is by increasing the residence population tributary to the business center. To do this, cheap transit must be provided. Of course there are limits beyond which the street-railway system cannot afford to extend its lines for a nickel fare. But those limits are always something less than what they would be if an extension were always required directly to pay for itself. Not only will such an extension develop business which will afford more and more nickels as the neighboring population grows, but some of the increase of the business center traffic of the old lines may properly be attributed to it. This contribution, however, is general or common to whatever lines serve the latter traffic rather than confined to those controlled by the company building the extension. But the American city is in general served by a single inclusive system, which thus gets the full benefit of the extensions and outlying lines.

It follows from the above that it is *not* necessary that every line of a street-railway system should pay for itself separately and directly and immediately. In every business large outlays are made with no expectation of immediate and direct return. Outlying lines of street-railways in particular come under this principle. It is a very difficult practical problem to determine just how much an extension may economically be allowed to fall short of paying for itself. But in general a street-railway should consider all the possibilities beforehand and take the consequences of its judgment. Because of the vested interests impaired by the advancement of the rate of fare on any suburban line, the general principle of a flat rate should not be encroached upon because of small losses on outlying lines incurred by a company having a net work of lines extending through an entire city. . . .

The most important question at issue between the street-railways and the public is as to the limit of distance which a passenger may expect to be carried from the center of the city for five cents. It is a public interest and should be a fundamental point of public policy to make the five cents carry the passenger as far as possible. But in many instances the street-railways have done all the public should require of them in this direction, partly because they have wished to exclude competitors from the exercise of franchises that they have expected to become valuable. The present task is one of equalization and adjustment of the limit of carriage for a single fare, and of bringing it up to a reasonable standard in certain instances, rather than of generally extending it.

Whether that standard is 10 miles or something short of it we shall not attempt to say. It certainly is more than 5. A mile for a cent is, in the opinion of many practical street-railway men, about the limit of the average ride for street-railway service. But the limit of distance of transportation from the business center is a question of the maximum, not of the average. The length of ride on some extensions of surface routes appears to be unduly great, even after allowing these long routes some benefit of differentiation, yet if such lines are a part of a comprehensive system, that fact should be taken into account. The showing of the extension separately considered is not conclusive as to whether the five-cent rate is reasonable for it or not. We have above seen how the principle according to which a loss on a branch road may be no loss is, to a degree, also applicable to street-railway systems. The differential principle may, from this viewpoint, be applied with great force to favoring long riding into the suburbs. So far as increased short riding at the business center is a direct consequence of carrying more people to that center, it is not even necessary that the prime cost of the latter carriage shall be less than five cents, for it contributes largely, though indirectly, to the profit from the short rides of the business center.

Even if the street-surface railways have sometimes overreached themselves in the matter of extensions, it is not entirely clear that the public should be expected to pay the cost through an increased fare on such lines. The natural conditions of surface street-railway service protect such enterprises from any extreme development of long-haul business. The time consumed makes the street-surface road the practicable means of transportation for only a limited distance from the business center. The outlying lines of surface railways in the very large cities will, in the long run, be used chiefly as feeders for more rapid means of transit. Long rides on such surface lines to the business center will then be exceptional, and will probably occur at such hours as would make their prime cost less than a nickel—else the rush-hour traffic is not true to its name and does not care for speed. Hardly more than the maintenance of the *status quo* is necessary to give due consideration to all interests as regards these long or outlying lines.

Those who speak for the railways are prone to make too much of extensions of line as an indication of increase in the average length of ride. Such extensions are doubtless made in response to a growth of population, which also means that the distance between residence and business centers is becoming increasingly great. But though some are now riding longer distances between home and work, others who walked before are just pushed beyond the walking limit and many more are attending to errands within the business center by riding short distances instead of walking. As a city grows the number of rides always increases faster than population. With an increase in population of 30 per cent, rides may be expected to increase 60 per cent.[1] While the five-eighths of the passengers representing the old business are doubtless taking a longer ride, the three-eights recently gained are quite as clearly relatively short-haul traffic. It is evident that the change does not certainly mean a significant increase in the average length of ride. The accompanying increase in density of traffic also favors economical service; and the per capita contribution of the citizens to the support of the railway has increased faster than the extent of the latter's permanent plant.

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[1] This is a conservative statement. Statistics bearing on the relation between urban population and street-railway traffic may be looked for in the 1910 report of the New York Public Service Commission, First District.

It is the essence of any just conception of street-railway rates that the long-haul traffic between residence and business centers should not be considered by itself. If it is correct to compute separately the cost of this traffic and of inner-city traffic, it is even more certain that three cents is too much for the latter than that five cents is too little for much of the former. The fact is that the two are naturally and economically bound together. No rate policy for outlying districts should neglect this consideration.

Were there not the prospect of rapid-transit lines (with their low operating cost per seat-mile) taking over most of the long-distance home-to-work traffic, a radical rearrangement of fares on outlying surface lines might soon have to be considered. The system of differentiation cannot specially favor relatively increasing long-distance traffic. A kind of business that barely pays prime cost can be carried comfortably if it will remain only (say) 10 per cent of the total; but its growth to be 20 or 30 per cent might bring disaster. The steam roads are now feeling the effects of the disproportionate growth of favored long-haul traffic between large urban centers. Further extensions of street-surface lines in the largest cities, other than for rounding out an existing system, are not much to be expected under a uniform 5-cent rate. It is to the rapid-transit lines that must be entrusted the preservation of the single fare from increasingly distant residence portions to the business centers of the largest cities.

The relation of transfers to the rate of fare on street-railways is a vital one. It has been so persistently the practice of railway men to count transfers as passengers and to figure an average fare on this basis, that it appears to some to be the natural means of increasing revenues to charge for transfers as if they constituted an additional service. For some purposes it is important to know the number of transfers. But the unit of service rendered by the railway company is the passenger trip and the unit of payment for that service is the single fare. The changing of cars is an accident of a passenger trip. The number of times it has to be done is determined chiefly by the routing of cars, or by the choice of a place of residence in relation to place of work that disregards this accident or incident of the daily journey. The necessity of changing cars would not be disregarded by the public if the transfer involved an additional payment. Under a system of pay transfers a company could, by an artificial routing of cars with a view to making the most of transfer receipts, considerably increase its revenues at a disproportionate cost to the public. Under such circumstances the routing of cars would have to become a matter for detailed public regulation. It is altogether better to allow the company to route cars according to its administrative convenience with regard to the direction of the movement of traffic. It will then try to reduce the need of transfers as much as may be, thereby combining economical operation with accommodation to the public. So long as the passenger mile is the unit of street-railway service, any reasonable trip that cannot be accomplished on a through car should be made possible by the use of a "free" transfer. . . .

It is the stock argument of those who oppose free transfers that they mean a declining rate of fare or an increasing length of ride, or even both. If the transfer be counted as a passenger, which is the way to arrive at a declining rate of fare, it is not at all likely that the length of ride for such a "passenger" has on the average even held its own. If the revenue passenger be taken as the unit, it may be that there has been an increase in the average length of ride (including in the single trip its continuation on another car). Of course one or the other of these arguments must lose its force when the two are combined. But granted that the ride is longer, and granted also that this has come about by reason of the general use of transfers, it still does not follow that the physical cost of carriage (the car mileage involved) has correspondingly increased, or increased at all. The long rides effected by transfer will be in directions or over routes not much frequented, else the company would through-route cars over them and avoid the necessity of transferring so much. The longest rides effected by means of transfers, it would be generally admitted, are those from outlying parts of town somewhat into the business center and then out again in a different direction. Such rides are taken at odd times and also in such a way that in part they are likely to be back load on cars otherwise almost empty. They are therefore rather profitable than otherwise to the company. This is doubtless rather generalized geography. Some restrictions of the transfer privilege are entirely just. The general allegation as to length of ride, however, of itself proves nothing. Chicago has recently taken steps to favor precisely such surface traffic from end to end of the city across the business center.

According to the idea of differentiation here presented, the differential character may find expression either in charging a varying rate for substantially similar services or in charging the same price for services differing in character. A highly important differentiation in the service of street-railways is observable in the different conditions of carriage and treatment for rush-hour and non-rush passengers, the former being crowded and in large numbers compelled to stand, while the latter are given room and seats enough and to spare. Whether this is a reasonable differentiation is a question upon which the public seems to have adopted an opinion against the practice of the railways. The question is a particularly urgent one in the case of the New York subway. How far is the crowding there an over-crowding? The easy way to dispose of the matter is to assume that the number and proportion of standing passengers is the measure of over-crowding. But this assumes that it is feasible to maintain the same quality of service in the rush period and in the non-rush period, quality of service being defined with reference to the wishes of the passenger, namely, a seat at will for the length of his ride.

Does it mean the same thing, either from the viewpoint of the passenger or from that of the railroad, to furnish a seat in the rush period and to furnish one in the non-rush period? During the rush hour the average passenger trip is longer, in other words the passenger at that time wants more for his nickel. On the other hand, the providing of extra and otherwise little used equipment and employees for the peak-load means, for the railway company, a greater cost of the service per physical unit at this time. The demand for seats may be four or five times as great at the rush hour as it is in the middle of the day. It would seem that the only way to deal with this situation is to admit the necessity of a different standard of service for rush and non-rush periods, in other words, of differential treatment. If the rate of fare is to remain constant, it would seem necessary to allow a company to provide relatively fewer cars for its rush-hour than for its non-rush travel. This must be the case if the company is to receive the same revenue per car-mile, since the longer ride means heavier loading, that is more passenger-miles and more passengers in the car at the same time, the number of passengers (fares) per car-mile remaining the same. It is possible that the railways should be allowed even a little more than this. Perhaps the revenue per car-mile ought to be somewhat higher for the rush-hour service. True, it is not at all inconsistent with a correct theory of railway rates that the relatively invariable (''fixed'' and other) charges apportioned to non-rush traffic should be great enough to allow rush-hour traffic to escape with comparatively little burden in addition to prime cost. But the staple business of a railway company, that which needs no encouragement and is on the contrary willing to put up with pretty bad service, is not the portion most likely to be favored. And the prime cost itself may be expected to be somewhat higher in the rush than in the non-rush hour. So it is clear that ''a seat for every passenger'' cannot be adopted offhand as the standard of service during the rush. Over-crowding may not be the same as crowding enough to compel some passengers to stand. . . .

The recognition of the presence of differentials in the customary five-cent fare helps towards an understanding of the most important questions of public policy in relation to street-railway rates. It is true that external differentiation of charges is seldom to be considered. The street-railway fare should in general be simple and single, and in America this means ''flat'' at the nickel. Transfers between car routes of the same company, having little to do with costs, should have as little to do with rates; they do not ordinarily constitute a peculiarity of the passenger trip that deserves special consideration. But the problem of a proper standard for rush-hour service should be regarded in its relation to differentiation. Crowding during the rush-hour should be defined by reference to prime costs as well as to physical conditions. Most important of all, the limit of carriage to residence districts distant from the business center should be determined by a rather refined application of doctrines of prime cost and of secondary profits, and, as regards the surface lines, with reference to the self-limiting nature of the service. Rapid-transit lines are the natural means of preserving, for the largest cities, the ''single fare'' to their distant parts.

169. Fares *

It is quite probable that the old rule that the local riding increases with the square of population would still be found to apply in a great many cities when all means of transportation are included, and that where trolley riding has fallen off or remained stationary the difference is represented by the number of passengers carried by automobiles. It is hardly reasonable

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* Excerpts from Blake and Jackson, *Electric Railway Transportation* (By permission McGraw-Hill Book Co., Inc.), Chap. VIII, pp. 185-214.

to expect that persons accustomed to paying two or three times for everything else which they purchase, compared with pre-war prices, would very long be deterred from riding on the trolley cars simply because of a 20, 40 or even 60 per cent increase in fare. Whether all or most of the traffic lost to the private automobile can be recaptured is still a question, but the increasing congestion in city streets and the growing stringency of parking laws may force many of these automobile passengers back to the trolley cars and public utility buses. . . .

The two fundamental factors determining the rate of fare are cost per car-mile and passengers per car-mile. Thus, if the cost per car-mile, including return on the investment, is 50 cents and the average number of passengers was ten, the fare could be 5 cents.

The cost per car-mile, in turn, is affected by a great many factors, of which speed is one of the most important. This is affected by the number of stops per mile, extent of street congestion, topography of city and other factors. Other large elements in the cost of operation are platform charges, taxes and amount of investment.

Traffic density, measured in average passengers per car-mile, though varying inversely with the number of car-miles run, is not necessarily a measure of service, because the arrangement of the streets in one city may permit it to be served adequately by a considerably less track mileage than another city of the same size. Traffic density per car-mile also varies directly with the average length of ride, so that a city with a short average haul ought to be able to carry passengers for less cost, other things being equal, than a city with a long average haul. . . .

Modification of Fare Through Transfer Charge. In some instances the railway company has been able to keep down its unit fare by making an extra charge for a transfer. This is usually either 1 or 2 cents but in the case of the Tacoma private and municipal railways the larger private company receives 3 cents for every passenger transferred from the Municipal lines, while the Municipal lines receive 2 cents for each passenger who transfers from the Tacoma Railway & Power Company. The pay transfer is used to a considerable extent in New York City between companies in the same railway system, like the New York Railways system, but transfers are not issued between independent companies except in special instances.

There is ample justification for a transfer charge, partly because a two-car rider averages a longer haul, and partly because it costs more to carry a passenger the same distance on two cars than on one car. It offers therefore a logical and easy way of increasing the average fare, particularly where the car routing is such that the transfer charge does not appear to be imposed by peculiarities in car routing. Thus, in a fan-shaped city, the charge of discrimination because free transfers are not given is more likely to be brought than in a territory like Manhattan Borough, New York, where the topography seems to call definitely for north and south routes distinct from east and west routes.

At this point it may be mentioned that the free transfer is almost exclusively an American flat-fare derivative. It is used on distance-fare railways only for short shuttles or extensions. On those Continental tramways operated with flat fares, it was customary in pre-war days to charge one-half the unit fare for a transfer. For example, in Berlin, the initial fare cost 10 pfennigs and the transfer another 5 pfennigs. The routing, however, was generally such that the transfer rider received a substantially longer trip. Post-war fares and practices on the Continent have changed frequently because of the amazing fall in the value of all Continental monies. . . .

First Steps Toward the Zone Fare; Foreign Zone Systems Explained. First of all, let it be understood that, while the foreign zone fare is based on length, there is no hard-and-fast rule of geographical distances, such as some American regulators and railway managers thought was necessary. The original British parliamentary act relating to fares stated that the rate must not exceed 1 d. (2 cents) per mile; and the war-time increase raised this permissible maximum to 1.5 d. (3 cents) per mile. This was far from meaning that the routes of British tramways were divided into geographical miles or within the 500 ft. plus or minus that was tried as a tolerance range in this country. The law really meant that the average length of ride for the penny (or 3 halfpence) should come to one mile.

In practice, the situation was this: Each route was cut up into sections corresponding as closely as possible to the principal traffic places along the line. This was further modified by shorter sections in downtown or neighborhood-center districts where traffic came readily, and longer sections in the outer districts where riding prospects were few and seats at a discount. Therefore, no two cities in Great Britain gave the same length of ride for a base fare. No one tramway gave the same length of ride in all parts of its community for a base fare. Finally, the same base fare might buy anything from $\frac{3}{5}$ to $1\frac{1}{2}$ miles or more on a given route.

In the second place, the zone fare was modified by other conditions: to a limited extent by non-transferable, unlimited-ride season tickets and to a general extent (as compelled by law) by the workman's reduced rate. The latter, broadly defined, means that the one-way ordinary fare will pay for a round trip, provided that the morning ride is taken before 7:30, 8 or some other limit fixed by local regulations. Some tramways permit the return trip to be made any time after 1 P.M. while others do not honor the return half of the ticket before 4 P.M. or so.

In the third place, the zone fare has been modified by such voluntary concessions as the off-peak rate of the London County Council Tramways instituted April 19, 1920. This innovation involves the important economic point of relation of seat-use factor to rate of fare and is, therefore, worth more than a passing remark. . . .

Under the London County Council Tramways plan, there was established between the hours of 10 A.M. and 4 P.M. in one direction and 10:30 A.M. to 4:30 P.M. in the other direction, a flat fare of 2 d. (4 cents) on routes granting an ordinary fare range of 1 to 6 d. In other words, a route which charged 1 to 6 d. in the peak hours and the night hours could be traveled for 1 and 2 d. The 1- and 1.5-d. rates were the same at all times.

In general it may be said, based on observations made in 1921 in London, that the off-peak fares were most successful on routes which connected a poor housing district with a large public park. On many days, the off-peak traffic doubled and even tripled because of the large number of family parties. This class of riding was a financial and civic success.

The off-peak fares were also successful on certain routes where shopping travel is good. The normal ride to the local center might cost 1.5 d., but many shoppers preferred to pay the extra half penny so they could ride to the bigger shopping district of Westminster. This was a gain for the tramway but a loss to local merchants, who saw their customers rolling by to the more attractive stores beyond.

The off-peak fares were least successful in the wealthier districts, where people in a hurry preferred to pay full fare on the underground lines or else to ride on the bus in fair weather. . . .

American Zone-fare System. The first large-scale departure from the flat fare was that of The Milwaukee Electric Railway & Light Company, made at the suggestion of J. D. Mortimer, then president of the North American Company, which controlled the Milwaukee property.

The Milwaukee plan may be defined as a central-area system in which the base fare (5 cents to Nov. 2, 1919, and since then 7 cents cash and special ticket rates) is charged within a district 8½ to 9 miles in length and 6 miles in width, conforming mainly to the city limits of 1914. The additional fare for suburban riding is 2 cents per mile (approximate) zone. When a 5-cent fare for the original area was no longer possible, the company expressed a desire for continuing this fare within a 3.5- to 4-mile belt from the center of Milwaukee. The State Commission, however, ruled that the base fare for the original area should go to 7 cents cash. The company's position was in accord with the correct principles of zone fares. By keeping the 5-cent fare as a minimum, it would have been able to retain the desirable short-haul rider. This case illustrates the difficulties of building up zone fares in a country which was raised on the extraordinary idea that the same fare should apply to an entire political entity, no matter how big it is.

Previous to 1919, several other installations were made of quasi-zone-fare systems. One of these was made by the Hudson & Manhattan Railroad, which operates through tunnels under the Hudson River. On this road there are three fares, namely 5 cents between any two stations in Jersey City or Hoboken, 6 cents between Jersey City or Hoboken and downtown New York, and 10 cents between Jersey City or Hoboken and uptown New York. As passengers paying 6 cents form the largest group and passengers paying 10 cents the next largest, the method of fare collection is as follows: Each passenger entering a Jersey City or Hoboken station drops 6 cents into the farebox, irrespective of his destination. If he goes downtown in New York, he makes no further payment. If he goes uptown in New York, he deposits 4 cents pay-leave in the farebox in the uptown New York station. If he intends to go to another Jersey City or Hoboken station, he asks when he pays his 6 cent fare for a rebate check. This entitles him to a rebate of 1 cent when he leaves the New Jersey station, if presented promptly after the arrival of his train.

With westbound travel from New York, the process is simpler, as the passenger drops 10 or 6 cents in the box, depending upon whether he enters an uptown or downtown station.

Passengers eastbound between local stations in New York pay 5 cents on entering and receive a coupon which entitles them to pass through the leaving station without further payment.

Local passengers westbound in New York pay 10 cents on entering and receive a rebate of 5 cents at the leaving station.

As described, the method may seem somewhat inconvenient, especially to travelers between local stations in New Jersey and in New York, but it is designed for the needs of the great majority of patrons, *i.e.* those traveling between New Jersey and New York. The local New Jersey and New York passengers are not only comparatively few but are for the most part regular patrons, so know just what to do. . . .

Why Has the Zone System Not Proved More Successful? Considerable space has been given to the consideration of the applications of the zone system in this country because the point is sometimes raised, both inside and outside the street-railway industry, that a uniform fare is illogical and that a zone system would be very much better for the public and company. Nevertheless, although many varieties of zone systems have been tried in this country, only a few have been retained and these differ from the European zone system in two particulars, namely, there is usually a large central zone with a comparatively large minimum fare, and the zone boundaries are considerably farther apart than abroad.

Two reasons can be given for the partial failure of low-fare short-distance zone systems in this country. One reason is that both public and railway men have become used, through many years, to the uniform-fare plan, and neither would gain sufficiently, in their opinion, to make a change worth while. In the second place, no very satisfactory method of collecting the zone fare has been developed for American conditions. All those tried are cumbersome compared with the single fare. It is true that no American company has attempted to install the European system of zone-fare receipts issued by the conductor and held by the passenger for occasional examination by company inspectors. The reason for this is that such a plan would require a larger operating force per car than the single-fare system, and the tendency in this country is to cut down rather than increase the transportation employees per car operated. The European system would require also uniformed inspectors to pass through a car occasionally to examine the tickets held by all passengers and, with the standing loads on many American cars in the rush hours, this would be rather a difficult undertaking.

Finally the American system of coinage, which was probably one of the initial reasons for the American system of fares, favors its continuation, even though the average fare now is more than

5 cents. A zone system in this country with 5 cents as a base is workable, but any sum less than 5 cents per zone would be inconvenient both to pay and to receive. If this country had had the British penny or a single commonly used coin of about that value in its monetary system when street-railways were started, American railways might now generally be on the zone system. It is significant that in those parts of the British Empire where the British monetary system prevails the zone system is used; whereas in Canada, whose monetary system is based on the dollar, the uniform fare, but with numerous ticket variations, is favored.

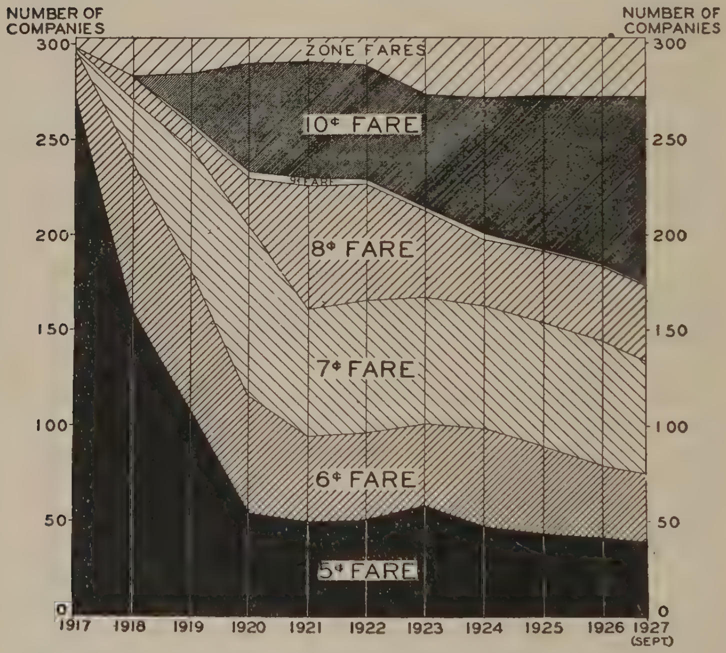
Hence, it is improbable that any general zone systems with a minimum fare of less than 5 cents will be put in force in the United States. There is no reason, however, why a company should not put in a special low fare on a special short route. Thus in 1923 the Eastern Massachusetts Street-Railway put on a run for the summer from the center of Lynn to Lynn Beach, a distance of ¾ mile, and charged only 5 cents for the round trip. It is in ways of this kind, by making a low fare apply only to special cars on certain short routes, that a company which wishes to develop short riding over one or two individual routes can do so without getting into difficulties in the way of fare collection.

In such a case, as well as in the more common practice of collecting a second and a third unit fare on long suburban runs, a company can usually get good advice on the selection of its fare-limit points from its conductors. They are the ones brought in closest contact with the company's customers, and they know the way in which any fare plan is likely to be regarded by those who pay fares. In fact, it is a good rule in any kind of business that a merchant must convince his salesmen that the goods they have to sell are worth the price and that the sales conditions are fair before he can be very successful in bringing the customer to this belief. This rule should apply in electric railroading.

170. Distribution and Trend of Fares 1917-1927

Chart 84

BASED ON 303 COMPANIES OPERATING IN 288 CITIES OF THE UNITED STATES HAVING A POPULATION OF 25,000 AND OVER



171. Basis of Electric Rates *

The Rate Research Committee . . . believes that there are two fundamental principles.

First: The rates of the company should, as a whole, produce an income sufficient to give a fair return on the investment and

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* From Report, Rate Research Committee, *National Electric Light Association Proceedings* (1914), pp. 70-92.

Editor's Note: Of this report the chairman of the Committee, Charles E. Neil, wrote on June 25, 1928: "In reading over the text, one is impressed with the progress which has been made since 1914 in the theory and technique of rate-making. Even the vocabulary of rate experts has experienced evolution!"

attract capital freely to the enterprise. The gross earnings from the sale of the product must, therefore, be sufficient to cover all the necessary expenses of operation, including taxes, bad debts, etc., a reserve for renewals and contingencies, interest at current rates, and a reasonable profit in addition.

Second: When the rates as a whole are giving a fair return on the investment as above provided for, then the rates to separate individuals and classes which go to make up the rates as a whole, should be so adjusted as to make the total cost as low as possible, and the service rendered as great as possible, by means of the most effective utilization of the plant.

The Committee has further come to the conclusion that these results can be best obtained by adjusting the various rates to the *value of the service* rendered, giving proper consideration also to the relative costs of service, and defining value of the service rendered as the amount which the user would have to pay for the same or equivalent service under absolutely fair but not destructive competition. . . .

Rates as a Whole. It should be noted that when the total revenue from the rates equals the value of service as thus defined, it will not give more than a fair return on the investment, as above indicated, since if competition were absolutely free, another seller might be willing to provide equivalent service and undertake the whole business for the lesser price.

When any seller supplies more than one individual or class, the rate applied to each class, whether uniform or not with the rates to other classes, must be equal to or above or below the value to the buyer.

A rate that exceeds the value to the buyer will result in no business, because the buyer will obtain the same or equivalent service elsewhere, at a less price.

Rates equal to or less than the value to the buyer will result in business, and the seller must get his whole return from such business only.

Reduction of Rates. If a rate that exceeds the value to a prospective buyer be reduced to such value, and at the same time the rate to no other class be reduced, additional business will be done and additional income will come in.

If, however, the reduction of the rate to the prospective buyer involves reduction to those who are already buyers, then such reduction may overcome the increase of income from the new business. . . .

If the reduction in rates results in new business that involves additional expense greater than the additional income, thereby reducing the net income, such a rate is less than the cost or value to the seller, is unprofitable, and does not satisfy the requirements of the cost of service tests. Such rates would not be made under free competition, except when reasons of company policy are the determining factor rather than the value to the seller.

If, however, the reduction of the rate to the prospective buyer is (a) down just to the value to him, so that business results, is (b) not below the cost or value to the seller, so that it brings in more added income than the added expense, and (c) does not involve any reduction of income from other buyers, then the result is profitable to the seller. . . .

These reductions have no immediate effect on the new buyer. If the rates to an individual or class that formerly did not buy are made just the same as the amount they formerly paid for equivalent service, such customers are no better and no worse off, since they continue to pay the same amount as before, but to a different seller. Such a rate gives the prospective buyer no advantage that he did not already have.

These reductions have no immediate effect on the old buyer. The old buyers continue to pay the same rates they formerly paid, and all the competitors of the old buyers continue to pay what they formerly paid, though to a new seller.

These propositions, however, depend on the price to the *prospective* buyer being just the value to him and *no lower*. If the reduction be too great, it might be an unfair advantage to him and a disadvantage to his competitors who continue to pay the old price. Since reductions are always possible until finally all classes that can be supplied are supplied, and this means a balance between the amounts of business done in the different classes so as to use the investment most efficiently. The result of these reductions is at first an increase of profit to the seller.

When the profits to the seller are increased so as to be excessive and to exceed a fair return, whether by such a reduction as described or by any reduction in the seller's total costs, then the original seller should reduce the rates or a new seller is likely to come in and do business at lower rates.

It is the province of commissions that regulate the prices of monopolies to regulate prices along these lines so that the public may obtain substantially the same prices that they would obtain under fair competition, and provide that the public and the seller jointly may share in the savings that come from the avoidance of any unnecessary duplication of plant.

However, unless some of the profits are given to the seller, there will be no incentive for him to plan for a reduction of any sort, and this profit for the seller above any ordinary return is only his fair return for the extra skill in management initiative, risk or energy that makes the reduction possible.

After allowing for a fair return to the seller there may still be possibilities of reductions when profits are above a fair return. The conditions are the same whether these profits are caused by using the investment more efficiently or by any other reduction of costs.

Destructive competition, of course, may temporarily force prices down, but in the long run will raise them. There is, however, an intermediate point where fair competition may reduce prices by establishing new and lower values. The question is: ''To what level would free but not destructive competition reduce the prices?''

This case of reduction of rates, caused by competition, due to excessive profits or to a reduction in the seller's costs, is one thing. The other case is a reduction of some rates only because of some new method of doing *parts* of the business, as when electricity took the lighting business from gas but did not compete with gas for cooking.

Competition. Competition of *other* methods with certain classes only, would naturally affect only those classes and those rates. Competition (actual or potential) of the *same* methods by a similar seller affects all classes momentarily, but later affects only some. Free competition of another seller doing all the work in exactly the same way may momentarily affect all classes and all rates, but a reduction would not affect equally the business in the different classes. In some cases, a reduction might increase business not at all; in others, greatly. In all the cases, the new rates would, under free competition, gradually adjust themselves just as before, so as to produce amounts of business in the various classes that together would utilize the investment most efficiently. The rates, therefore, would in each class finally adjust themselves according to the potential competition; *i.e.* according to value, so as to produce the most efficient balance.

It follows, therefore, that all rates are affected by the actual or potential competition from other methods met with in each class, and if competition is free all along the line, the rates adjust themselves to the values as determined by such competition; and any set of rates, whether at the start uniform or not, will finally adjust itself along these lines if the service is to be used most efficiently. It cannot be too often repeated, however, that the competition herewith referred to is the kind of competition that is fair and permanent, and not merely temporary or destructive. Destructive competition that merely reduces prices temporarily is not what we are considering at all. Such competition does not permanently reduce prices; on the contrary it will ultimately raise them.

In the case of so-called staple articles, which anyone can make or use, and where the cost has but little reference to the quantity made, competition establishes a market price or rate, uniform sometimes over the world. Here competition affects all classes equally. When, however, competition affects classes unequally or when cost varies under different conditions, rates are not uniform but vary with conditions, according to the values in each case.

Starting with any rates, whether a single uniform rate or a complicated schedule, if such rates are not already adjusted to values, then they can be modified to the advantage of the community by so adjusting them. When they are not adjusted to the value, it means that there is a potential buyer who would pay a real profit but who fails to get the service because he is asked too high a rate; or else there is an actual buyer who is paying so little that he is an actual loss and is being supported by the other buyers, and is really receiving a subsidy from the other buyers in order that he may use the service.

It should be noted that when a supplying company withholds service from any potential buyer who is willing to pay more than the added expense of supplying him, then his refusal of service hurts all the other buyers, since, if he were supplied at a rate that showed *any* profit at all, the additional business obtained would, in the long run, help the other buyers.

However, the rate asked from him, if it is going to be *lower* than that charged the other buyers, should be *just as high as he can afford to pay*, but when it is just as high as he can afford to pay, then the fact that it is lower than to the other buyers is of no disadvantage to them, while the profit that he brings in is ultimately for their advantage. It is assumed, of course, that the rates are the same to all buyers supplied under the same or substantially the same conditions.

The problem, therefore, is to determine the value in each case; *i.e.* what each class can afford to pay rather than get along without the service. It is not so much a question of what one individual can pay, as of what the class as a whole will pay so as to preserve the balance between the business of that class and the whole, or to readjust the balance so as to use the investment more efficiently. . . .

Monopoly Profits. If there is a monopoly the prices need not necessarily be reduced, but the seller may be given some or all of the extra profit within reasonable limits.

Further, if the monopoly is controlled the controlling authority may take the extra profit in the form of a tax or free service for itself or may decide who shall get the profit, as by requiring that free service be given to schools or at some arbitrary price to some particular class.

Adjustments of prices to particular classes are sometimes made by controlling authorities for so-called sociological reasons. It should, however, be noted that attempts to solve sociological problems by means of low public utility rates are usually inefficient. A high rate for purposes of limiting business, like the saloon tax or tax on phosphorous matches, may be worth while, but giving unnecessarily low rates to any particular class only results in unnecessarily high rates to some other class. It is clear, however, that any class that pays an unusually high rate could pay a direct tax just as easily, while there would be an intermediate class that would have been able to get the advantage of the service at a fair price, but is prevented from using it at all if asked to pay a higher rate, and this is to the public advantage.

These considerations have to do with the economic aspect of such special rates rather than the question of their expediency as a matter of public policy, which, in general, we consider outside the province of this presentation. Taxing the users of electric light for certain municipal purposes or for the benefit of a certain class of the community is of doubtful value, and while we feel it is clearly not our province to discuss all of these cases, yet there are a few that may be mentioned where control of prices for sociological reasons is approved by public opinion.

One reason is that although the good trader or shopper can usually, under free competition, get a better rate than the man who does not trade, yet the controlling authority forbids any difference in rates for this reason and requires that any difference in rates be available to all, irrespective of their skill in trading for a lower price.

A second is that a city often wants to develop its vacant land, and hence requires uniform utility rates in all its territory, even when values might be different in different sections. Under free competition a seller might make large profits by selling at low rates in the built-up portions, and at higher rates or not at all in the less built-up portions, but most city authorities discourage this so far as possible by providing that if a company gets rights to sell in the rich section, it must sell in the poorer section at the same rates.

A third case where rates are controlled is that the controlling authority requires that rates shall be fairly uniform in respect to time. In ordinary business the seller sometimes attempts to whet his customer's appetite by making a low rate for a short time, or a landlord may make low rates in order to fill up his building, with the expectation of raising rents later, but such procedure is not usually considered proper for a public utility, unless it is very clearly announced that such low rates are merely temporary and it is expected are to be raised.

The public utility is expected to make its rates such that no permanent business shall be built up except on rates that are reasonably certain to be permanent.

Values as Determined by Free Competition. Leaving out these cases where a controlling authority requires rates to be something different from what they would be under free competition, we may now consider how the values are to be determined in the other cases so as to give the most efficient use of the investment.

The simplest method is, of course, for the seller to use his judgment as to the value of the service rendered in any particular case. This is the method used by lawyers, doctors, ministers, artists, and in many commercial businesses also; but whenever there are numerous values to be determined, especially if they are to be determined beforehand, this method becomes impracticable, and some test or method of differentiation must be adopted.

When a test is used it can never be perfect, but the loss and disadvantage of the cases when the test does not perfectly discriminate according to value, is less than the trouble of deciding each case separately. We must, therefore, consider the various tests of value, but should note that various practical tests are not always the real tests. For instance, the practical test when selling coal on land is the weight; and when at sea, the practical test is its volume or cubic feet; while the real test for value of coal would be the heating value, irrespective of weight or volume.

The whole problem is sometimes simplified and sometimes complicated by the fact that the tests of value not only slide into each other, but often masquerade under each other's names. For instance, take the question of a big factory and small residences side by side. There is absolutely no question that the rates must be different, but in order to accomplish this difference, either a straight wholesale differential may be made, or a long hour differential can be used, or the business can be classified as between business and residences, or as between factories and residences, or still other tests can be used, any of which would be satisfactory for this case though they might not be satisfactory if they were applied to towns with factories, stores, residences, apartments, hotels, etc., etc. . . .

It should be noted that in any particular case the value is determined only when business is actually done; *i.e.* when the value momentarily becomes equal and an exchange is made.

Tests of Variations in Values Physical. Things that are physically different, as oats and straw, have different values, even if the product of the same operation. Sometimes one of these is known as the principal product, and the others as by-products, but the by-products may often become the principal product, and when there are numerous products of a single operation, it is impossible to say which are the by-products.

Kilowatt-hours, ampere hours, kilowatts of demand and the connected load are all physical tests when applied to the consumer of electricity.

Things that are physically the same may have different values at different seasons, as ice and fruit. The supply of electricity in summer, as compared with winter, is of this class, and so is the business supplied on any so-called "off-peak" rate.

Things that are physically the same have different values at different places. Coal is of different value at the mine and the pit, and electricity is of more value in the city than at the waterfall.

All of these differences in values are limited by the possibility of substitution; *i.e.* aluminum can be substituted for copper for most uses, and for these uses its price cannot get away from a certain ratio to the price of copper. Copper price may affect iron price, iron price may affect wood, wood may affect coal, coal may affect food, food may affect oats, etc. In the same way, difference in value according to time is limited by cost of storage, and difference in value according to place, by cost of transportation.

Test of Value by Use. There are variations in value according to use, *i.e.* aluminum is worth some definite proportion of the price of copper whenever it is to be used for overhead lines, but if it is to be used for underground lines requiring insulation, then it is not worth as much. Grain alcohol is worth a certain amount if it is to be used for purposes for which wood alcohol would not be satisfactory.

This variation in value according to use is, as before, limited by the possibility of substitution. If grain alcohol were allowed to be sold for mechanical purposes at the same price as wood alcohol, no harm would be done so long as it was actually used for such purposes, but if such alcohol could be substituted for the wood alcohol and used for drinking, then no grain alcohol would be sold at the higher price.

These tests of value by use are very prominent in the government postal service. The rates for post-cards, circulars, sealed letters, etc., are all tests of value according to use. In electricity the power rate, as distinguished from the lighting rate, is a test of value according to use.

Test of Value by User. There are variations in value according to the user. For instance, furs are of more value to an Eskimo than to an inhabitant of the tropics, but, as before, this variation is limited by the possibility of substitution, since if the purchaser at the low rate can resell, there will be no business done at the higher rate, and the actual values, as determined by the business done, will all be the same.

When a rate is made to members of certain societies, then the test of value is according to the user, and a rate made to churches or charitable societies is a test of value according to user. It may be noted that a variation in value according to user is in many cases really a variation according to use; as for instance, a telephone rate of one amount to residences and another amount to business places, is, on its face, a difference in rate or test of value according to user. Yet it may just as well be said that this is a test according to use.

Variation in Value by the Output. There are further variations in the value that arise when a total output varies; as for instance, an article may be produced by hand at one cost or value, irrespective of output, but if made by a machine, the cost or value for making a single article will be much greater, and for a very large number of articles, very much less than hand-made prices.

It may be noted that the cost does not always go down as the output increases. When only a few machines are being used, the cost may go up temporarily when the capacity of the first machine is reached, and a second is necessary for a small increase in output.

Further, it may be noted that there are at least two kinds of business where the cost per unit increases with the output. One is the telephone business. Where the service covers a large city it cannot be operated at as low a cost per customer as by a station in a small town. The second is the hotel business. Where hotels will gladly supply a dinner at say $2 a plate, for a small number of people, they will have to charge a much higher rate per plate if asked to supply exactly the same food, same service, same rooms, etc. for a banquet.

While other tests of value may be used, it is thought that in general all the tests can be classified among one of these five classes; viz., physical tests, tests of time, tests of place, tests of use, tests of user and tests of output.

It is important to note, however, that when a difference in rate is made, there must be a difference in value both to the seller and the buyer, so as to make the rate effective. If there is a difference in rate and no difference in the value to the buyer, then all the business is done at a lower rate. If there is a difference in the rate and no difference in the value to the seller, then another seller (under free competition, of course) would come in, and, if he shaded the higher rate and did not offer the lower rate, would do a more profitable business than the first seller and force him out of business.

Now of these five tests of value, the physical test and also time and place can be used to test values to either the seller or the buyer, while the tests of use and user apply only to the buyer, and the test of output, only to the seller. Hence, in making a rate, physical conditions or time or place can be used alone, since such differences in value apply both to the buyer and the seller; but if use is to be made a test of value, this can be done only when some other tests apply also to the seller; as for instance, the output or time; and vice versa if output affects value to the seller, it can be applied only when one of the other tests also applies to the buyer.

Our problem therefore, is to take the tests that are used; *i.e.* electric rate schedules now in use, and see how the variations therein expressed can be deduced from this theory of value of service, or rather to what extent the rates as actually used in practice agree with these principles.

172. Principles of Rate-Making for Gas Companies *

Costs Divided into Four Basic Groups. We find that we have four different groups of costs involved in gas service and that all of the four must be used in the structure of the rate if each customer is to pay his just share of the total cost of the service. In other words, the cost of gas service is made up of four elements:

1. Production-demand costs.
2. Distribution-demand costs.
3. Customer costs.
4. Commodity costs.

These groups of costs have definite and varied characteristics, and each one must be referred to a different unit of the service rendered.

The unit of service covered by the *production demand* is the readiness to produce one hundred cubic feet of gas in one day. The unit for the *distribution demand* is the readiness to deliver one hundred cubic feet of gas in one hour. The unit for the *customer costs* is each customer himself. And the unit for the *commodity* is one thousand cubic feet of gas as measured by the customer's meter.[1]

It is apparent that no one measuring device is adapted to measure all of the service rendered. The gas meter will take care of the measurement of the commodity; but an entirely different device must be used to measure the daily and hourly demand. . . .

Rates for Various Classes of Business. In many situations the total load is made up of several classes of business, each with its own peculiar load characteristics.

For example, a company's business may be divided into 50 per cent domestic, 25 per cent industrial, 15 per cent hotel and restaurant, and 10 per cent house-heating. In such a case, a careful study will disclose the fact that the varied use of the equipment by these different classes has an important influence on the structure of the rates. It will be found necessary to first apportion the expense of carrying on the business between the classes in the proportion that these expenses are caused by each class. Each portion may then be separately allocated and unit costs or a theoretically correct rate determined for each class.

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* Excerpts from Appendix I of the 1926 Rate Structure Committee Report American Gas Association.

[1] The use of 100 cu. ft. for the units of *Production* and *Distribution* demands and of 1000 cu. ft. for *Commodity* is arbitrary. However, these are the quantities generally used.

However, . . . while there are some costs which are caused by a particular class of business and can, therefore, be allocated directly to that class, there are others that are common to all classes and it is difficult, and sometimes impossible, to determine the portion that is caused by each class; therefore, these common costs must be allocated on a reasonable basis that takes into consideration that development of the business which will result in the greatest good to the greatest number of customers. . . .

Rate Forms. The theoretically correct rate, if applied to the gas service used by all the customers, will provide an adequate return to the utility. It will do even more than this. It will assess the total costs of operating the business fairly and equitably among the individual customers. This rate is the only rate that will place the burden just where it belongs. Any modification of it, however slight, will discriminate against some customers.

The theoretically correct rate is the rate that should best develop the business. It encourages a good load factor thereby providing against unproductive idleness of costly equipment.

With this rate the customer, . . . may use large quantities of gas at the comparatively low price of the *commodity*, provided that by such use he does not increase his maximum hourly or daily demand.

Expediency of the Theoretically Correct Rate. Up to the present, however, in most communities it has not seemed expedient to propose the adoption of a theoretically correct rate. The reason for this is that people have been so long accustomed to pay for gas at a flat rate per thousand cubic feet that they are not ready for immediate acceptance of a basis of payment, however correct, which they do not understand. Customers do not generally realize that their interests would best be served by the application of a rate that would require each individual to pay for exact value received. They do not realize that in this way the physical equipment provided for their service would inevitably be used more evenly during the hours of the day and during the days of the year with a consequent lowering of costs and a reduction in price to every one.

The old system of a flat rate per thousand cubic feet of gas ignored entirely the value of "readiness to serve." In consequence many customers were, and are, served at less than cost, while on the other hand large industrial customers and others making long hour use of relatively small demand for gas are penalized by rates considerably above cost. People have not yet been educated to pay for "readiness to serve" nor have they been informed how scientific rates would benefit the public at large as well as the gas utility.

It is obvious that the application of scientific rates under the circumstances generally prevailing would increase the bills of a certain proportion of a company's customers. In past considerations of this phase of the problem, it has been assumed that these customers would be of the poorer class and least able to contribute a pro-rata share of the cost of the business. On the contrary, the results of several investigations indicate that small customers are more generally found among the tenants of higher priced apartments and in the offices of public and professional men. . . .

While the rates in use seem to be of great variety there are really less than ten distinctive types. These will now be described briefly.

Flat Meter Rate or Straight-Line Meter Rate. EXAMPLE: $1.50 per M cubic ft. The flat meter rate is the oldest and the simplest form of rate and is still used by many companies throughout the country. This type of rate is objectionable because each customer does not bear his fair share of the expense of gas service unless it happens that all the customers of the company have about the same demand and use the same quantity of gas. But ordinarily if the rate is such that the company earns a fair return on the value of its property, the small customers and customers with poor load factors are paying less than it costs to serve them, and the loss is made up by the large customers with good load factors who have to pay more than they should.

Flat Meter Rate with Service Charge. EXAMPLE: Service Charge $.50; all Gas $1.35 per M cubic feet. The first change from the flat meter rate was the addition of a meter or service charge. This additional charge insures to the company a certain minimum income per customer, regardless of whether the customer uses gas or not and regardless of the quantity he may use. This service charge is approximately equivalent to the *customer charge* of the scientific rate.

Step Rate. EXAMPLES: Where consumption is under 10,000 cubic feet @ $1.55 per M cubic feet.

Where consumption is over 10,000 cu. ft. and under 20,000 cu. ft. @ $1.45 per M cu. ft.

Where consumption is over 20,000 cu. ft. at $1.35 per M cu. ft.

The next change was the substitution of a "step rate" where all the gas sold to any one customer was figured at one unit price; but the price for large quantities of gas was lower than that for small quantities. The effect of this rate is to give a lower price to large customers without any reference to their demands. This is very unfair as between customers, for, while it is true that there are certain large customers whose large use of gas is the result of many hours' and many days' use of relatively low demands, and in such cases the rate approximates a fair rate; yet there are other customers who use large volumes of gas but use it in a very limited number of hours or days. Such customers are not entitled to reduced rates for large quantities of gas because the fixed charges on the production and distribution equipment assigned to their use are necessarily high in proportion to the quantity of gas used. The step-rate has another objectionable feature in that in many instances the total charge for a larger quantity of gas is less than the charge for a smaller quantity of gas. It is obvious that such a rate is discriminatory.

Block Rate. EXAMPLE:

First	100,000	cubic feet	@	$1.55 per M cubic feet
Next	200,000	" "	@	$1.20 per M cubic feet
Next	700,000	" "	@	$1.10 per M cubic feet
Over	1,000,000	" "	@	.90 per M cubic feet

An improvement on the step rate is the "block rate" where the initial volume of gas is sold at a certain price per 1,000 cubic feet and successive blocks at progressively lower prices. This rate avoids the most objectionable feature of the step rate—that is, the fact that one customer may pay more for a smaller quantity of gas than another customer does for a larger quantity; yet it does not avoid the discrimination as between customers on account of the difference in their demands for gas.

Block Rate with Small Initial Step. EXAMPLE:

First	400	cubic feet or less	for $1.05
Next	9,600	cubic feet	@ $1.35 per M cubic feet
Next	40,000	cubic feet	@ $1.30 per M cubic feet
Over	50,000	cubic feet	@ $1.25 per M cubic feet

An improvement on the ordinary block rate described above, is a block-rate having a very small initial step. This rate, like the one just described, lacks any demand element and is discriminatory as between customers of different demands. It approximately, however, takes care of the *customer charge.* That is to say, the small initial quantity insures that every customer shall pay a certain minimum amount monthly regardless of his further use of gas.

Block Rate with Service Charge. EXAMPLE: Service Charge $1.00.

First	5,000 cubic feet	@ $1.20 per M cubic feet
Next	5,000 cubic feet	@ $1.15 per M cubic feet
Over	10,000 cubic feet	@ $1.10 per M cubic feet

Another variation of the block rate is the block rate with a separate service charge. The service charge was discussed in connection with the flat meter rate. The service charge may be applied to any form of rate.

Demand Rate. EXAMPLE: Demand Charge 4¢ per cu. ft. of maximum hourly demand.

Commodity Charge 80¢ per M cubic feet.

This rate consists of a *demand charge* and a *commodity charge.* The *demand charge* is based on the customer's hourly demand; the *commodity charge* on the quantity of gas consumed.

This rate takes into account the hourly *load factor* of the different customers, but it does not give proper consideration to the costs that vary with the 24-hour demand and to this extent varies from the scientific rate. It also fails to take into account the customer costs but for large customers this item is not important.

In the general application of this rate both the demand and commodity charges may take the block-rate form.

Three-Part Rate. EXAMPLE: Customer Charge $12 per customer per annum, payable in 12 monthly installments.

Demand Charge—$22 per 100 cubic feet of maximum hourly demand per annum, payable in equal monthly installments.

Commodity Charge—80¢ per M cubic feet.

The "three-part rate" includes in addition to the Demand and Commodity features, a Customer Charge to take care of those costs which vary with the number of customers served.

Such a rate would be very close to the scientific rate, especially if it took into consideration those costs which depend upon the 24-hour demand.

In the example given the Demand and Commodity charges follow the flat meter rate form but both may take the form of block rates.

TABLE 97

Application of Theoretically Correct Rate to Several Customers

(1) Monthly Consumption of Gas	(2) Observed 24-Hour Demand	(3) Diversity Factor	(4) Assessed Demand	(5) Production Demand Cost per Customer per Month at $.29 per 100 Cu. Ft.	(6) Observed Hourly Demand	(7) Diversity Factor	(8) Assessed Demand	(9) Distribution Demand Cost per Customer per Month at $4.42 per 100 Cu. Ft.
400 cu. ft.	30 cu. ft.	2.	15 cu. ft.	$.044	30 cu. ft.	6.	5 cu. ft.	$ .221
1,000	75	1.5	50	.145	36	6.	6	.265
2,000	120	1.5	80	.232	60	6.	10	.442
3,000	170	1.3	130	.377	70	5.	14	.619
4,000	204	1.3	157	.455	80	4.5	18	.796
5,000	260	1.2	216	.626	80	3.5	23	1.017

Summary

(10) Monthly Consumption of Gas	(11) Production Demand Cost	(12) Distribution Demand Cost	(13) Customer Cost at $1.10 per Customer	(14) Commodity Cost at $.386 per 1,000 Cu. Ft. of Gas Used	(15) Total Gas	(16) Cost per 1,000 Cu. Ft.
400 cu. ft.	$.044	$.221	$1.10	$ .154	$1.52	$3.800
1,000	.145	.265	1.10	.386	1.90	1.900
2,000	.232	.442	1.10	.772	2.55	1.275
3,000	.377	.619	1.10	1.158	3.25	1.083
4,000	.455	.796	1.10	1.544	3.90	.975
5,000	.626	1.017	1.10	1.930	4.67	.934

TABLE 98

SCHEDULE OF RATES

Theoretically Correct Rate

Prod. Demand $ .29 per 100 cu. ft. of 24-hour demand
Distr. " 4.42 " " " " of 1-hour demand
Customer 1.10
Commodity .386 per M

Block Rate

Rate A

First 400 cu. ft. for $.60
Next 9,600 " " @ $.95 per M
Next 40,000 " " @ .90 " "
Over 50,000 " " @ .85 " "

Block Rate

Rate B

First 400 cu. ft. for $.75
Next 9,600 " " @ $.85 per M
Next 40,000 " " @ .80 " "
Over 50,000 " " @ .75 " "

Block Rate

Rate C

First 400 cu. ft. for $.60
Next 2,600 " " @ $.95 per M
Over 3,000 " " @ .75 " "

Block Rate with Service Charge

Rate D

Service Charge $.25
First 2,000 cu. ft. @ $.90 per M
Next 8,000 " " @ .85 " "
Over 10,000 " " @ .80 " "

Straight Line Meter Rate with Service Charge

Rate E

Service Charge $.75
All gas @ .75 per M

MONTHLY CONSUMPTION	THEORETICALLY CORRECT RATE		RATE A		RATE B		RATE C		RATE D		RATE E	
	Col. 1[a]	Col. 2	Col. 1	Col. 2	Col. 1	Col. 2	Col. 1	Col. 2	Col. 1	Col. 2	Col. 1	Col. 2
400 cu. ft.	$3.800	$ 1.52	$1.500	$ .60	$1.875	$ .75	$1.500	$ .60	$1.525	$ .61	$2.625	$1.05
600 " "	2.732	1.63	1.317	.79	1.533	.92	1.317	.79	1.317	.79	2.000	1.20
800 " "	2.237	1.79	1.225	.98	1.363	1.09	1.225	.98	1.213	.97	1.688	1.35
1,000 " "	1.896	1.89	1.170	1.17	1.260	1.26	1.170	1.17	1.150	1.15	1.500	1.50
1,200 " "	1.696	2.03	1.133	1.36	1.192	1.43	1.133	1.36	1.108	1.33	1.375	1.65
1,400 " "	1.553	2.17	1.107	1.55	1.143	1.60	1.107	1.55	1.079	1.51	1.286	1.80
1,600 " "	1.446	2.31	1.088	1.74	1.106	1.77	1.088	1.74	1.056	1.69	1.219	1.95
1,800 " "	1.338	2.40	1.072	1.93	1.078	1.94	1.072	1.93	1.039	1.87	1.167	2.10
2,000 " "	1.273	2.54	1.060	2.12	1.055	2.11	1.060	2.12	1.025	2.05	1.125	2.25
2,200 " "	1.259	2.77	1.050	2.31	1.036	2.28	1.050	2.31	1.009	2.22	1.091	2.40
2,400 " "	1.214	2.91	1.042	2.50	1.021	2.45	1.042	2.50	.996	2.39	1.063	2.55
2,600 " "	1.159	3.01	1.035	2.69	1.008	2.62	1.035	2.69	.985	2.56	1.038	2.70
2,800 " "	1.128	3.15	1.029	2.88	.996	2.79	1.029	2.88	.975	2.73	1.018	2.85
3,000 " "	1.085	3.25	1.023	3.07	.987	2.96	1.023	3.07	.967	2.90	1.000	3.00
5,000 " "	.900	4.50	.994	4.97	.932	4.66	.914	4.57	.920	4.60	.900	4.50
10,000 " "	.788	7.88	.972	9.72	.891	8.91	.832	8.32	.885	8.85	.825	8.25
25,000 " "	.683	17.07	.929	23.22	.836	20.90	.783	19.57	.834	20.85	.780	19.50
50,000 " "	.562	28.10	.914	45.72	.818	40.90	.766	38.32	.817	40.85	.765	38.25
Per Cent of Required Revenue Produced by Rate												
	100%		100%		96.78%		94.69%		93.83%		99.00%	

[a] Col. 1—Rate per MCF. Col. 2—Monthly Bill.

Minimum Charge. A "minimum charge" is also included by most companies as a part of the rate. This charge is a partial substitute for the Service Charge or Customer Charge; it insures to the company a certain minimum income per customer regardless of the quantity of gas he uses. It is unlike the Customer or Service Charge in that it is not a charge in addition to the charge for gas.

Application of Theoretically Correct Rate. In the preceding tabulation the theoretically correct rate is applied to the gas service used by several customers having various monthly consumptions (see col. 1) and daily and hourly demands (see cols. 2 and 6).

The daily and hourly demands may be accurately determined by the use of instruments devised for that purpose. In some instances these demands may be estimated by taking the capacity for gas consumption of the various appliances connected with the companies' mains (sometimes called the *connected load*) and considering the probable use of these appliances. Another method would be to take hourly readings of the meter but this is not practicable except for purposes of verification.

The rate cannot be applied to the observed demands of each customer because of the fact that these demands are not necessarily coincident. There is a diversity between the hours and the days selected by the individual customer for his use of his maximum demand. Therefore, the actual maximum demand on the system [2] will be less than the total of the maximums of all of the individual customers. If the rate were applied to the observed demands of the customer it is clear that the revenue would be in excess of the requirement. It is necessary first to apply a *diversity factor* (cols. 3 and 7) which will have the effect of distributing equitably among the customers the saving in investment charges resulting from the fact that less equipment is required. Because of the difficulties encountered in obtaining the data for the determination of the diversity factor, this item is often a matter of judgment. In this case it was obtained by studying the load factors of the various customers and comparing them with the plant load factors.

Columns 4 and 8 represent the assessed demand after the diversity has been applied.

Columns 5 and 9 represent the application of the unit demand costs to the assessed demands.

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[2] It will be remembered that this is what determines the amount of the property.

Columns 13 and 14 show the application of the unit customer and commodity costs.

Column 15 gives the total of these costs or the amount of the bill, and column 16 shows the value of the gas service in terms of cost per 100 cubic feet.

This tabulation illustrates why the application of the theoretically correct rate encourages long hour use of the service.

Comparison of Various Rates. The following tabulation is a comparison of the average rate per 100 cubic feet derived from the application of the theoretically correct rate and several alternative rates of different forms.

This tabulation shows how some of the rate forms approximate the correct rate. It will be observed that these rates invariably favor the small customer.

173. Telephone Rates *

Local Telephone Rates. If only one class of telephone service were furnished by a telephone company, each subscriber would pay an equal share of the operating revenue of the company, but telephone companies generally have to supply direct or party-line business and residence service at flat rates, or in some cases at measured service rates; rural or farm-line service, postpayment or prepayment pay station service, and private branch exchange service. Extension sets and extension bells must be provided where required and provision must be made for ''switching'' lines of coöperative or farmers mutual companies which own and maintain their own lines.

Two-number and particular person toll or long-distance service must be offered which require the adoption of an initial period and rate, and a rate for conversations which extend beyond the initial period. Special rates must be given at night to induce the public to use long distance lines during hours of ''light load.'' Report charges must be made to prevent unfair use of telephone service by means of a prearranged code of reports.

The use of meters at substations has been many times proposed and discussed. Although they have never been used, service demands may make their adoption desirable, The principal objection to the use of meters seems to have been the added complication of apparatus and the consequent increased cost of maintenance.

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* Excerpts from C. A. Wright, F. L. McKinney, *Engineering Extension Bulletin No.* 7, College of Engineering, Ohio State University, Dec. 30, 1920, pp. 20-27.

It is apparent that the determination of such a rate for each of the above classes of service, that no injustice will be done any of the subscribers, and that the total operating revenue will be sufficient for the continued operation of the telephone company, is not an easy problem.

Each business or industry should be self-supporting. A test of its value to its community is the willingness of consumers to pay enough for the commodity to support the industry.

A telephone company should, according to this point of view, be self-supporting. This has not always been the case. There are cases where telephone systems have been supported in part by systems elsewhere, so that competition might be destroyed by providing service at low rates.

It might appear at first sight that each class of telephone service should be self-supporting, but this is not always the case. In the long run each class of service should support itself. If a class of subscribers will not pay rates sufficient to cover the cost of the service provided, another class of service should be developed for them which will be self-supporting. However, it is frequently necessary to give a class of service temporarily at such a rate that it is not self-supporting in order that it may be developed to the point where it will pay for itself.

The first telephone companies to offer telephone service in the United States, before 1880, offered it at a ''flat rate'' per year. People who wished telephone service formed clubs and ''subscribed'' for service. The term ''subscriber'' was applied to any one who bought telephone service. Probably because the telephone companies wished to know what income could be depended upon and the subscribers wished to know what their service would cost, a flat rate was most satisfactory. A rate for measured service charges the subscriber who originates the call with the full value of the call. This is unjust in that the call is of value also to the called subscriber. One public utility commission has assumed that 50 per cent of the value of the call is chargeable to each of the called and calling subscribers. It would be difficult to prove that the value of the call is the same to each, but at least the call has some value to each subscriber, and the cost of the call should not be entirely borne by the subscriber who originates it. For this reason a flat rate has seemed more just than a measured rate. Partly because it has been customary and partly because of the above reasons a flat rate was used everywhere until

1894, and it has been used everywhere except in the larger cities since that time. It has been said that the telephone business is a flat-rate business. It is a flat-rate business, except under the conditions which exist in the larger cities.

Prior to 1894, the telephone company operating in New York City found that under the flat-rate system the excessive and frequently wasteful use of the telephone was greatly increasing operating difficulties and at the same time entirely preventing the use of the telephone by smaller users who did not feel justified in paying the higher rates. The flat-rate system did not encourage the subscribers to save the service, and there was no incentive to the telephone company to encourage subscribers to use more service. Those subscribers who used telephone service to only a small extent paid the same rate as the largest users and thereby paid for service which should have been paid for by the larger user.

Measured service was planned to correct these difficulties and succeeded to an unexpected degree. After the time of its introduction into New York City in 1894, the number of subscribers increased at a very much more rapid rate than before that time.

In flat-rate districts a distinction was made between residence and business service because in addition to the fact that the cost of giving business service was greater than that of residence service, its value to the subscriber was greater, and a lower rate to residence subscribers induced the development of that class of telephone service. The effect of the development of telephone service is of course cumulative; its value to all subscribers increasing as the number of subscribers increases.

Party line and private branch exchange service were developed to make possible the more efficient use of telephone lines. The cost of giving such service and its value to the subscribers are less per subscriber than "direct" service, so that the rate is proportionately less.

Rural service was developed under unfavorable conditions. Most companies found it hard to induce farmers to buy telephone service and as they were anxious to develop this service they made rates which were very low. In many cases service of this kind is not nearly self-sustaining and is being paid for largely by the city subscribers.

The attempt to charge even amounts for telephone service should generally be avoided as it frequently results in service at rates much greater or less than cost. "Dollar a month" and "Nickel a call" service are familiar examples of this kind. Postpayment and prepayment coin-box service developed to meet the needs of the occasional user frequently result in the payment of a rate for telephone service which differs from the cost of this service.

There have been many cases where public utility commissions, acting for the public welfare, have ordered telephone companies owning and operating toll lines to permit other companies to route calls over these toll lines. In such cases, in justice to the companies owning the toll lines, they have prescribed rental rates which would more than make this service self-sustaining.

Trafficking in telephone service has generally been prevented in this country by the efforts of the telephone companies and of the public utility commissions. In Massachusetts the hotels were ordered not to resell service at rates higher than those charged by the telephone companies.

Until recently, telephone subscribers were more or less permanent, but during the past few years the number of subscribers who take service for a short time or who wish frequent changes in the arrangement of substation sets has increased to such an extent that it is unfair to permanent subscribers not to make a special connection charge for such service. If such charges are not made, the rates to all subscribers must be increased, and the permanent subscribers will be forced to pay for services performed for the convenience of the temporary subscribers.

The practice of making connection charges was instituted during the period of government operation and its fairness has appealed to such an extent to many telephone companies that they are continuing the practice. In most cases, however, the connection charge does not cover the cost of making the connection or change, but is sufficient only to discourage unnecessary changes, or waste of service.

Toll Telephone Rates. The simplest and cheapest class of toll telephone service is ''two-number'' or ''station-to-station'' service, in which the calling party is satisfied to talk to anyone at the called station. ''Particular person'' or ''person-to-person'' service has been developed to meet the needs of those subscribers who wish to talk to a particular person in that distant city. The cost of particular person service is of course greater than that of two-number service because of the necessary additional effort on the part of the operators to establish the connection. The rate for particular person service is generally 25 per cent greater than that for two-number service. This differential in rates is not equal to the additional cost of a particular person call over a two-number call, but is sufficient to induce the amounts of development of both classes of service which will be most satisfactory and economical. Too great or too small a differential would tend to cause the abandonment of one or the other of these classes of service, both of which are desirable. When the calling subscriber, in initiating a particular person call, appoints a particular time at which he wishes to talk to the called subscriber the rate charged is 50 per cent greater than that charged for a two-number call. The operating expense of such a call is greater than that of the classes mentioned above, and it is not as desirable to encourage the development of such a class of service. If messenger service is desired in connection with the call, the cost of this service is added to the cost of an appointment call.

It has not been customary to make an additional charge in cases where the charges are reversed, even though greater operating costs are involved.

''Report'' charges are made if the called party is not in or will not talk, or if the connection is established within an hour and the calling party cannot be reached. Report charges have been made necessary to prevent the exploitation of telephone service by means of prearranged codes of reports, a practice which had become altogether too prevalent. The cost of making the report approximately equals the difference between the costs of two-number and particular person calls.

Economy in the production of any kind of service is promoted by the continuous use of equipment at as nearly as possible, its maximum capacity. Just as lighting and power companies endeavor to level their peak loads and sell service which will increase the use of their plants during light-load periods, so telephone companies offer inducements to subscribers to use long distance lines during the hours when the traffic is normally light. A rate of about one-half the station-to-station day rate generally applies to calls initiated between the hours of 8:30 P.M. and midnight. One-quarter the station-to-station day rate is charged for calls initiated between midnight and 4:30 A.M. These reduced rates result in the development of profitable traffic over telephone lines during periods when they would otherwise be idle.

The ''initial period'' for which a charge is made should be the medium between too long a period, which would unfairly distribute charges by making the subscribers whose conversations are short, pay the same rate as those whose conversations are long, thereby encouraging the waste of service by the former class of subscribers; and too short a period which would cause inconvenience to the subscribers and a consequent decrease in the value of the service to them. In most cases the initial period is three minutes, although this is not always the case.

The rate charged for the overtime period, which is generally one minute, must not be so high as to encourage the originating of two or more short calls in place of one longer call, and it must not be so low as to encourage waste of service. It is usually slightly less than one-third the rate for the initial period.

For simplicity in the application of these rates, the rates for the overtime periods for each class of service are proportional to the rates for the corresponding initial periods, even though it has been strongly argued that the cost of establishing the connection is the only element of difference in the costs of various classes of service.

The practice of charging for long distance service in multiples of five cents often results in rates which apparently do not vary according to the above principles, especially in the case of ''short haul'' calls.

The cost of long distance service is generally affected by the distance over which the connection is established, the length of the time the equipment is in use during the call, and the operating cost of establishing the connection. Sometimes the length of the connection or the route affects the operating cost, as when the services of a ''through'' operator are required, or when supervision by two operators instead of one is necessary.

There has been much discussion as to whether toll rates should cover the entire cost of toll calls from subscriber to subscriber, or only from toll switchboard to toll switchboard. If, as has been done by at least one public utility commission, the subscriber to subscriber cost is assumed, it will be found that in many cases toll service is not self-sustaining.

If toll service is partly supported by exchange rates higher than necessary to cover the cost of exchange service, the development of exchange service may be retarded, or if toll rates are too high, toll development may be retarded.

Too low toll rates might be justified in some cases, however, because toll service is an asset which increases the value of the telephone service to all exchange subscribers.

During the period of government operation of the telephone companies a uniform schedule of rates was established for all companies. While such a schedule has advantages it is almost sure to result in toll rates which are too high in some cases and too low in others, with the results suggested above.

It may be seen that in addition to cost, the rate for each class of local and toll telephone service is affected by habit and custom, value of the service to the subscriber, competition and unfair influence, the necessity for developing various classes of service and for preventing waste and unfair use of service, and the necessity for making the method of charging simple and easily understandable to the average subscriber. . . .

CHAPTER XVII

OWNERSHIP OF THE PUBLIC SERVICE INDUSTRIES

174. Customer Ownership *

Customer ownership of public utilities no longer is in need of definition. The idea is a familiar one to the motorman on the street-cars and his varied passengers—some of them laborers, some of them clerks, some of them federal, state and city employees, some of them public utility workers, some of them industrial executives, some of them bank presidents, and probably one of them the mayor of the community.

Their individual conceptions of customer ownership may differ greatly, but basically, those conceptions are built on the common knowledge that customer ownership of public utilities is the public ownership by the thrifty people of that community, with private operation in which they as partners are a part, of certain important businesses necessary to that community's life. The time has come when the motorman on each street-car and his passengers in assorted occupations—and by that is meant all classes of American citizens—should contemplate customer ownership from the standpoint of what it has accomplished, while the utility industry must give increasing study and attention to the lines along which the movement may be extended and the practices through which its fullest benefits may be realized.

Any review of the accomplishments of customer ownership is, of necessity, mildly historical. Previous to its adoption, utility financing had a tendency toward ever-increasing maturing obligations, with the equity back of them decreasing at a proportionately faster rate. The logical conclusion was the impossibility of raising further money by borrowing, the necessary stopping of development or the finality of a going, earning business in the hands of its creditors due to lack of necessary capital. Customer ownership has corrected this condition by providing a constantly

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* Excerpts from M. J. Insull (with acknowledgments to F. Scheel and D. O. Murphy), "Customer Ownership," *American Gas Association Proceedings* (1924), 185-191.

widening market for junior financing, and thereby modifying the financial structure of the companies availing themselves of this market from credit to partnership obligations. It is furnishing an important percentage of capital requirements for improvements and extensions; it is strengthening the credit of those companies by supplying increased protection for the senior financing. It has made the price of senior financing cheaper because of the increased equity placed back of it, with the consequent increased security of principal and interest of the creditor. And eleven words suffice to state one of the plan's paramount accomplishments: It has helped to popularize all classes of securities of utilities.

Customer ownership has been a source of strength for the utilities, in that the pyramiding number of owners have increased the company's protection against the dangers of public misinformation. There have been countless instances where butchers and bakers and candlestick makers have, to protect their 7 per cent return on a hundred dollar investment, argued publicly against unfair demands upon utilities. The activities of customer shareholders in territories where state or municipal ownership and operation of utilities are proposed have had cumulative effects of untold value in two ways: they have tended to dissipate the worth of municipal ownership as a political argument for aspiring candidates to office, and they have reassured senior and junior security holders of the affected companies living in distant territories, both of which effects have contributed toward stabilizing the market for public utility securities. Indeed, the political ownership and operation agitation necessarily will become less and less important as customer owners of utilities increase in number. For this, if for no other reason, the movement has been, and is, essentially constructive, since it brings about the ideal situation of real public ownership with the advantage of the initiative and energy of private, as compared with political, operation.

While customer ownership was and is primarily for the purpose of raising junior money, its academic worth in the matter of relations between the utilities and the public was recognized at the very beginning of the movement. Its importance as an instrument with which to build up good will has apparently limitless possibilities, and a vital consequence has been its creation of a corrective influence for the utilities from the outside. Shareholders do not stop at protecting their interest in the investment and its return from what they consider unreasonable attitudes on the part of governing bodies. On the other hand, they ask questions and make suggestions to the officers of the company in which they are interested, just as they defend, in discussions with their neighbors, the business in which they know themselves to be partners. They not only promptly report the neighbor's complaints and suggestions to the company for investigation and adjustment; they make suggestions of their own, and the effect on the whole organization is one of bringing the personnel up to a higher level of efficiency and courtesy. . . .

In so far as customer ownership affects the utility employees, an outstanding accomplishment has been the vastly improved morale of organizations using the plan. Employees have been encouraged to save money and become owners of the business for which they work, which has naturally increased their effectiveness, their interest in, and their knowledge of, the industry. This has tended toward a reduction of turnover, with appreciable savings in consequence. Thus the plan is a vehicle which has carried the average employee into a field of knowledge of the economics of the business, for as he has studied customer ownership—whether from the standpoint of a personal investor or as a salesman of his company's securities—he has become, unconsciously, perhaps, a working part of the great design of the movement.

Adjectives might well be exhausted without adequately describing the help customer ownership has been to the utilities, and then an entire new description would have to begin of the help customer ownership has been to the communities served by the utilities using the plan. Easier money has meant more new extensions and improvements, without which they might not be possible, and these extensions and improvements have created business and furnished employment. Money has increased in circulation, new residents have been attracted, new industries have been drawn, and the communities have become better towns in which to live. If satisfactory evidence of the worth of customer ownership were ever required, a great many towns in this country, which have become infinitely more livable and prosperous through the movement's operation, might well be cited as proof conclusive, without referring at all to the benefits of the plan as regards the utility companies themselves. In this connection, it is interesting to note that opposition which appeared originally on the part of bankers in communities when the plan was inaugurated has virtually disappeared. What they first thought to be the loss of a portion of their deposits, they discovered was to a considerable extent not a loss but a redistribution, for that part of the money received from sales of securities, not only to bank depositors but others, used in the community for the purchase of materials and supplies and wages, eventually finds its way back to the banks, and bankers in customer ownership towns are now, owing to the resultant influence for thrift, becoming advocates of the plan.

Certain intangible benefits have been important, perhaps the greatest of which has been the beating down of public ignorance regarding the utilities' affairs. The public is fair in so far as it knows the facts, and customer ownership is helping them to know more of the facts. Loose talk regarding the utility business has been minimized, both within and without the industry; the public is more interested, employees are more interested, and—in the last analysis—utility executives are more interested. The plan has proved its worth in more ways than can be mentioned. It has been accepted by all. We must look now to its broader extension. . . .

The idea of customer ownership, smiled, indeed scoffed at, not only by other businesses, but by members of the utility industry itself during the period when the plan was on early trial, has been alluring in its latter day development; so alluring that it has been appropriated by businesses whose very natures do not lend themselves to the customer ownership plan of financing. We now are confronted by the proposition of such enterprises using ''customer ownership'' as a catchword to attract unwary capital. Through patient, trying effort, through honesty and sincerity, we have given the term the dignified meaning of an opportunity to become partners in an indispensable business, intelligently and honestly managed, in which the customer owners' principal is well secured and continuity of dividend is practically assured. Hence, to extend customer ownership, one step which cannot be overemphasized is the importance of searing into the public mind the fact that customer ownership is irrevocably a part of the utility industry—that the words mean an ownership by customers of the public utilities serving them and do not mean anything else. The idea was created for the public utilities' protection; the public utilities now must protect the idea.

Customer ownership is a plan that must be safeguarded in these and other ways that suggest themselves, for it is the foundation upon which the most highly desirable credit conditions possible are being built. It is a basis for a high standard of public understanding, and there is no place in its workings for even a utility company that would go to the public for money with anything but a security safe as to principal and dividend. It would seem generally advisable that this security should be a preferred stock. The advantages of a preferred stock for sale to customers over a bond is that, first, we want partners, not creditors; and second, as partners they are entitled to a higher rate of return than a secured creditor; its advantage over the common stock, which should be held by those fathering the business, is that we want our customer partners to be better secured both as to principal and return than ourselves who are willing to risk our principal for a possible still higher, but less sure, rate of return. . . .

Protection of the integrity of the industry is essential to the full realization of customer ownership benefits, and that integrity must be fought for diligently. The public confidence in the utilities must never be destroyed. Once a business of high romance, it has become, for those of us who are working at it, a business of high faith—a faith that must be kept. Today we are swept along on a wave of gratifying popularity, brought about by our keeping the faith both financially and as to service during the stressful war times, in which we were largely helped by this customer ownership movement. There is no reason why an honest business run by honest men should not continue to remain popular in the public fancy, for the creed of honesty has meant for the industry and will always mean for the industry fair play with the customer, fair play with its army of partners, and a jealous regard of the fine honor to which we have won—the public trust. In that winning, customer ownership was a splendid ally. In its protection, customer ownership offers us practically unlimited aid, and the industry will reach its greatest height only when the plan is employed to its ultimate extent.

175. The Antecedents of Municipal Ownership in the Electric Light and Power Industry of the United States *

The antecedents of municipal ownership of public utilities consist of a heterogeneous mass of feeling and fact. For mu-

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* Excerpts adapted from Hubert F. Havlik, *Some Aspects of the Development of Municipal Ownership in the Electric Light and Power Industry*, thesis presented for the M.B.A. degree Northwestern University School of Commerce, Chicago, 1927.

nicipal ownership is a phenomenon arising out of a diversity of economic, sociological and political conditions all interrelated and reacting one upon the other. The most intensive analysis of a complete array of data would not convey the entire sweep and significance of the movement.[1] . . . For this reason a study of the economic aspects of municipal ownership would be incomplete without at least a sketch of the mass of thought and events which have affected its growth.

The electrical industry made its appearance in the middle of a period of rapid economic development and exploitation in the United States, which was accompanied by a change in the industrial organization of society. The strictly competitive era of commercial activity, which reached a climax in the panic of 1873, had given way to an age of industrial integration. The last quarter of the nineteenth century, although marked by fierce competition, was essentially a period of organizational cannibalism.

The coagulation of enterprises into what came to be known as ''Big Business'' or ''Trusts'' was motivated by the hope of larger profits, and was facilitated by the use of the corporate form of organization. Under cover of the corporate fiction, officials stooped to practices which they personally considered unethical. Bribery, corruption and exercise of undue influence were used to secure franchises, legislation or administrative regulation favorable to corporate interests.

These perversions of private interests led to the realization that the early economic philosophy of individualism, ''laissez faire''—so admirably adapted to the conquest of prairie and wood, dealt inadequately with the changing conditions. A new theory of social politics developed among the great middle classes, and was concretely expressed in labor legislation, the introduction of income and inheritance taxation, and regulation of industry. . . .

During this developmental period the rapid growth of population in the United States was marked by an increasing urbanization. . . . These new cities were a novel feature in American political and social organization and were very different from the old social and economic aggregates. They undertook a multiplicity of functions. The supply of wholesome water, the installation of sewerage, the lighting of streets, the maintenance of police forces; and the building of playgrounds, streets, bridges, civic centers, hospitals and other features of the modern city were freely undertaken. Pride in progress led to the free exercise of the taxing power and when this recourse for funds to meet the annual budgets was too burdensome upon taxpayers, debts were incurred. All this flow of money in and out of city treasuries was accompanied by the levying of tribute by politicians and grafters. Debts were incurred for amounts far greater than necessary, and soon become burdensome to taxpayers and ruinous to public credit.

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[1] "It would be quite a perversion of truth to resolve everything solely into its economic conditions, and it would be to misunderstand those economic conditions themselves. Economic wants are dependent on the whole social environment in which a people live." David G. Ritchie, *Darwin and Hegel* (New York: Macmillan and Company, 1893), p. 172.

State legislation and provisions in state constitutions limiting tax rates and the bonding power of cities in order to prevent wholesale looting and to protect credit were a natural sequence. In time, however, it became apparent that the debt limits in many states were so low as to prevent cities from financing the construction of facilities deemed necessary to public welfare. This in many instances made it impossible for the city to erect or acquire an electric lighting plant and explains to some extent the absence of municipal ownership of public utilities in those states which had or now have low or adverse debt provisions. . . .

As treated thus far, the factors outlined affect all public utilities alike. The development of modern political philosophy in response to economic progress and changing industrial organization in this country; the growth of the new city; the change in the nature of its problems and its influence upon the evolution of utility regulation, all intertwine and have the same effect upon all industries affected with a public interest. Yet municipal ownership of electric light and power establishments has been affected by one other set of factors, which are peculiar to it alone. These factors are found in the technological development of the electrical industry.[2]

The early use of electricity was limited almost exclusively to lighting purposes because of the expense of electric generation. Municipal electric plants developed as rapidly as did private plants, and were established as betterments in street lighting systems. The introduction of the electric motor, however, made the industrial use of electricity possible and it soon became profitable to generate electricity on a large scale. Municipally owned plants, not catering to private needs, left the industrial field to the private plant and confined their activities principally to street lighting.

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[2] See article by E. O. Malott, "Technology and the Widening Market for Electric Service" in Chap. IV of this volume, pp. 195-208.

Indeed, a town in an agricultural district, without industries, had to install its own plant in order to get electric service. Private enterprise was unwilling to forsake the lucrative higher load factors in industrial towns. Furthermore, public opinion in a small town or village is more easily crystallized and controlled than in a large town; there is a greater trust in political control and democratic government; there is also a greater degree of civic pride in public works, for rivalry with a neighboring town is often keen, and these circumstances, coupled with the relatively simple nature of electric provision, were propitious to municipal ownership.

At the time of the advent of central electric stations, many towns owned water plants and pumping stations because of the vital relation to sanitation, health, and fire protection. This previous presence of public ownership was a double incentive for installation of a municipally owned electric light and power establishment. First, where one service had been satisfactorily rendered by the municipality, there was a confidence in the directors of the existing enterprise which made it easy to introduce public ownership of other utilities.

Secondly, there was an economy in the combination of services. Investment in new buildings was minimized by use of available space in the pumping station buildings. Overhead expenses, comprised of this last item and of salaries, wages, and fixed charges on investments in steam engines, would increase but little. The use of the steam engine could be planned to provide power for both water pumping and electric generation. A water tank could be pumped full during the time when there was no need for electric current—in a small town usually after midnight and in the daylight hours. The reserve of water in the tank allowed the use of the steam engine for electric generation during the evening, or in other hours when current was needed. The combination of these two or other services where the uses of equipment could be dovetailed, was an important factor in accounting for municipal ownership in smaller towns. . . .

At the beginning of the last century, the electrical industry was already showing those tendencies which have brought about its present distinctive features. The most rapid development occurred in industrial centers and was brought about by private initiative. Municipal plants remained for the most part merely local lighting plants using old and now inefficient equipment.

In the larger towns, the lower costs of large scale production led to the supply of electricity for street light purposes by private companies instead of municipal plants. In a few instances, municipal electric light and power establishments took advantage of the new transmission lines and lower unit costs to purchase current needed in larger quantities which their plants could not generate as efficiently.

Since those early days of growth of the electrical industry has been astonishing not only in the character of the transformation, but in the astounding rapidity of those changes. It has taken on the aspects of a homogeneous, unified supply system, with relatively few large generating stations sending current to the many strategically located distributing stations. In this transformation the isolated plant has become more and more restricted to the small town in agricultural districts, away from transmission lines.

The cycle of change runs in well marked phases. First, the municipality recognizing the inefficiency and insufficiency of its obsolete plant, does not add new equipment in order to supply larger demands, but purchases these needs from a large private company, Second, the municipality, being able to purchase current at a cost lower than that at which it generates current itself, buys all of its current and keeps its own plant in reserve in case of emergency. Third, after service has become well established it buys all of its current from the private company; and becomes merely a distributing station or a purchasing agency. From this phase, it is but a short step to the total management of electricity supply by the private company.

Thus, the new technology has played a very important part in determining the nature and location of municipal ownership. Municipal plants have been absorbed or have changed their nature during the establishment and growth of the electrical net, except in those districts where the establishment of the net has waited upon the economic development of the territory. It can be said that municipal ownership follows economic frontiers and is pursued by the new technology. Whether it will change from a frontier phenomenon into the common mode of ownership in the electrical industry depends upon several factors. Public ownership must wait upon the complete development of technology of maturity in the electrical industry, so that routinized operation is possible. And even then municipalities must undertake to operate on a large scale in keeping with the characteristics of the industry. If not displaced by state ownership, municipal ownership will have to use the method of associations of municipalities into organizations or leagues supervising the distribution of electrical energy over wide areas. Such association of political units into economic units calls for a high degree of coöperative emasculation of sectional prejudices and a business-like plane of political activity which as yet are still in the process of development.

176. Rise of Municipal Ownership *

An increase in the number and importance of municipal functions may be viewed as the necessary result of the rapid and extensive process of urbanization which has taken place during the last fifty to seventy-five years. Many of these public functions are not performed on a commercial basis; it is to such as are so undertaken that the term municipal ownership particularly refers. The principal public functions conducted in this way are water supply and distribution, transportation, provision of electricity and gas for power, provision of light and heat, and of communication. More recently the provision of housing, food supply, fuel, and ice have come to be recognized as public functions and have been undertaken by some municipalities on a commercial basis. Instances of municipal ownership and private operation, although infrequent, represent a step half way between public and private enterprise, sometimes more satisfactory than either. . . .

In the United States central water-supply plants represent the class of public-service undertaking in which municipal ownership is dominant. The trend toward municipal ownership developed early because of the importance of a water supply for fire protection and the necessity of pure water for domestic use. Out of the 16 central water-supply systems known to have existed in 1800, one, that of Alexandria, Va., was municipally owned—6.25 per cent. The number increased to 28 per cent in 1835, 45 per cent in 1855, 54 per cent in 1875, fell to 43 per cent in 1890, and rose to 54 per cent in 1897. Present statistics on this industry are incomplete. It is estimated that there are about 10,000 places served from central water-supply stations in the United States. The number of plants, however, is much smaller, since many plants serve a number of places.

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* Excerpts from "Municipal Ownership," *Nelson's Perpetual Loose-Leaf Encyclopedia* (New York: Thos. Nelson and Sons, 1921), Vol. VIII, pp. 350-353.

Table 99 presents the facts with regard to water-supply plants serving places with 5,000 population or more. Based on a very careful survey, the compilation is, nevertheless, not quite complete, covering a population of 46,382,885 compared to a total population of 49,210,650 for all places of 5,000 or over in the United States. As is shown by the table, municipal ownership of water works appears to be more frequent in the larger cities. Only 73 per cent of the plants in places of 5,000 to 10,000 population are municipally owned, while 90.9 per cent of the plants in places of over 500,000 population are municipally owned, and 88 per cent of all plants of record in all places of over 5,000. Of 2,276 plants in places of less than 5,000 population for which the facts are available, 1,788, or 78.5 per cent, are municipally owned. Outstanding among the municipally owned plants as great undertakings are the water supply systems of New York, Chicago, and Los Angeles. The New York system is valued at $367,000,000 and serves a population in excess of 6,000,000. The Chicago plant is valued at $70,000,000. A notable feature of the Los Angeles system is an aqueduct over 220 miles long bringing a supply of water from the mountains to that city. . . .

Municipally owned gas plants are uncommon in the United States. In 1925, there were reported 71 municipal gas undertakings. Of this number, 4 were natural gas and 16 distributing plants only, leaving but 51 municipally owned gas-manufacturing plants. The total number of municipal artificial gas plants has been decreasing since 1914, when there were 138, representing 10.7 per cent of all artificial gas plants.

Most of the municipally owned gas plants are found in the smaller communities, as is the case with electric light and power plants: 48 of the 71 plants are in cities of less than 10,000 population. The percentage of plants municipally owned does not, however, show the real importance of the municipally owned gas plants, for while 5.1 per cent of the manufactured gas plants were municipally owned in 1923, they accounted for only 1.5 per cent of the product. Some of the more important municipally owned plants are in Philadelphia (Pa.), Richmond (Va.), Duluth (Minn.), Holyoke (Mass.), and Omaha (Nebr.). Omaha, which purchased its plant in 1920, is the last important city to municipalize its gas supply. The gas plant of the city of Philadelphia is leased to an operating company.

Municipal ownership of electric street-railway transportation, which is common in many countries, has not developed greatly in the United States. The outstanding cases are of recent development. San Francisco acquired its first line in 1912 and has added to it since. Seattle (Wash.) purchased a private system of 235 miles of track in 1918. Detroit acquired its system of 373 miles, the largest municipally owned system in the world, in 1922. In 1912 the only municipal railways in operation in the United States were those in Monroe (La.) and San Francisco. In 1917 the number had increased to 8 and in 1922 to 16. In 1926 there are municipal street-railway undertakings in Eureka (Cal.), San Francisco, Fort Collins (Cal.), St. Petersburg (Fla.), Lincoln (Ill.), Pekin (Ill.), Monroe (La.), Alexandria (Va.), Detroit, St. Louis, Portland (Ore.), Radford (Va.), Seattle, Tacoma, Minneapolis, and Ashtabula (Ohio). A number of these cities, however, operate their railways in only a limited way or as plant facilities. The St. Louis and Minneapolis lines, for example, are water-works facilities and the railway of Portland (Ore.), 1.5 miles in length, is a public docks facility. Municipal systems comprise about 800 miles of track, or 1.8 per cent of the total track mileage. Boston and New York own subways which are leased to private operating companies. The system in Bismarck (N. D.) is owned and operated by the State of North Dakota.

The movement toward municipal ownership of electric railways was given an impetus by the rising costs of electric railway operations, which could not be met by the companies under the fixed fares. Other influences were labor troubles and, more generally, a desire to avoid the conflict between city and company which existed in some places.

Cities in the United States have undertaken municipal ownership and operation of a number of other public or quasi-public services, but not so extensively or frequently as European cities. Very generally the drainage and sewerage systems are municipally owned. Fire departments, police departments, and parks are other familiar forms of public undertakings. A considerable number of cities established municipal coal yards as an emergency measure, and some have continued them. A few cities have municipal ice plants; of these, the plant at Omaha, Nebr., is the most important. Municipal street paving and repair plants, asphalt plants, etc., are frequently owned by the city. Many cities own and operate ports, piers, and terminals: New York City, for example, has extensive water-front properties and municipal wharves, while New Orleans has a publicly owned port which comprises in its equipment thirty-two wharves, cotton warehouses, a belt railway, grain elevator, and coal-handling plant. Other cities which have extensive municipally owned port facilities are Seattle, Baltimore, Los Angeles, Boston, San Francisco, Portland, and Chicago. Other utilities sometimes provided in the United States by the municipality are municipal markets, baths, laundries, ferries, central heating, milk supply distribution, and abattoirs. Several small cities have municipal telephone systems.

177. Political Ownership *

The purely governmental functions of a municipal, state or other governmental division must not be confused with its entrance into the field of industrial enterprise. In its governmental capacity the municipality, because of its inherent police power, establishes police and fire departments, builds its highways, erects and maintains public schools, and thus functions for the body politic in its governmental capacity.

When the municipality or political division enters the industrial field through the establishment of a municipally owned store, factory, electric light and power plant, or other business venture, it departs from its purely governmental activity and drops to the level of a purely business enterprise, assuming the liabilities and hazards of competitive business, and is subject to the same economic laws which govern all private citizens in other private business. Unfortunately this form of ownership, operation and management, because of its political advantage, continually attempts to evade the business standards which must be followed by competitive industries.

The records of the privately owned and publicly regulated electric light and power utility are carefully scrutinized by the regulating commissions, and its business transactions, as well as rates and services, are regulated by public authority, giving every citizen an opportunity to complain against any unreasonable discriminatory or arbitrary action, but the municipally or governmentally owned and operated public utility, through subterfuge and evasion, fails to comply with the standards imposed by the state.

The organization of governments is constantly going through experimental stages. New functions are continually being tried out—to be retained if successful, and to be dropped if not so.

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* Excerpts from pamphlet *Political Ownership and the Electric Light and Power Industry* (published for the information of member companies by the National Electric Light Association, 1926), Part I, pp. 5-14.

TABLE 99

MUNICIPAL AND PRIVATE WATER PLANTS IN THE UNITED STATES: DISTRIBUTION ACCORDING TO SIZE OF CITY SERVED

POPULATION	PRIVATELY AND MUNICIPALLY OWNED		PRIVATELY OWNED		MUNICIPALLY OWNED			
	No. of Plants	Population Served	No. of Plants	Population Served	No. of Plants	Percentage of Total	Population Served	Percentage of Total
5,000 to 10,000	515	3,612,381	139	981,459	376	73.0	2,630,922	72.9
10,000 to 25,000	333	5,187,099	96	1,512,029	237	71.2	3,675,070	70.9
25,000 to 50,000	107	3,888,808	24	882,449	83	77.6	3,006,359	77.3
50,000 to 100,000	61	4,386,783	13	849,098	48	78.7	3,537,685	80.6
100,000 to 500,000	59	12,223,136	7	1,618,550	52	88.1	10,604,586	87.1
Over 500,000	11	17,084,678	1	506,676	10	90.9	16,578,002	97.0
Total	1,086	46,382,885	280	6,350,261	806	74.4	40,032,624	88.5

Experiments in political ownership and operation of public utilities have been made on a large scale in some countries, and the results in every instance have proved to be inferior to the results of private ownership in the United States. . . .

The function of government is to preserve order and assure fair play—the guaranteeing of equal rights to every citizen. Business, to be successful, must be both progressive and aggressive. Governments therefore, cannot possess the qualities necessary for business success unless they are despotisms.

Experience proves that governmental bodies are less economical and efficient in performing their duties than are private individuals conducting a business, yet there are some cases in which an attempt has been made to justify government ownership as a matter of public policy. The most common example of this is the water supply. Closely related as it is to public health, with its commercial aspects secondary, it has been believed by some that water supply was properly a governmental function. Yet this public function has not been slighted by the private water companies. Nearly 40 per cent of the water plants are privately owned.

Protection from fire by the proper distribution of hydrants is part of the function of the water supply. Protection of the people from crime and accident by proper street lighting is another obligation falling upon the community. Prior to the advent of electricity, street lighting was done either by gas, the lights being furnished under contract by the gas company, or by oil lamps owned by the city and maintained in some cases by contract and in others by the lighting department of the city itself.

The incandescent electric light is so essentially the light of today that it is often forgotten that the early electric lights were arc lights, which were useful only under restricted conditions. Progressive store-keepers used them for the illumination of the cavelike interiors of their establishments, but for domestic lighting they were out of the question. They were only of value in lighting comparatively large areas.

So it was that municipal ownership began in the electric light industry. Such places as Detroit, Wheeling and Allegheny (now part of Pittsburgh) established arc lighting systems for their streets. A few years later, with the introduction of the incandescent lamp, there arose intense competition between the arc and the incandescent, many cities having separate companies supplying the two services, while in other cases the city owned the arc lights and a company owned the incandescent system. Gradually, as the industry felt its way along, it was found that two systems could not operate as economically as one, and consolidations inevitably took place, particularly in the generation of power.

The first few municipal electric plants started were considered great successes, not because of any economies they brought about, but because they were so far ahead of the lighting they had supplanted. And that was the beginning of the myth of "successful municipal ownership."

Experience has clearly demonstrated that municipal plants are less progressive than private companies, and that they are more backward in making the benefits of electricity available to the people at large. The best evidence of this is the complete change of attitude on the part of the manufacturers of electrical machinery. In the early days, any purchaser, municipal or private, was good game for the machinery salesman. But these machinery manufacturers with the accumulation of experience found that the private companies grew much faster than the municipal plants, with the result that repeat orders from the companies were more frequent. Naturally, the manufacturer of machinery wants to encourage the purchaser which expands most rapidly and therefore increases the demand for his equipment. The manufacturer is interested only in the question of whether the municipal plant or the private company would develop the electric light and power industry more rapidly. And the answer has been singularly one-sided. The far-sighted manufacturer invariably believes in the superiority of the company as the natural channel for the distribution of electricity, and therefore of his machinery and appliances.

Agitation for municipal ownership is frequently the result of real or fancied grievances against the company already serving the community. With public regulation as effective as it is now in nearly all states, recalcitrant companies can be compelled to give adequate service at reasonable rates, thus saving the city the expense and risk involved in municipal ownership. But the great danger to the public arises from the fact that many politicians encourage agitation for municipal ownership as a means of serving their own selfish ends. Trumped up charges, or faults easily remediable by far less drastic measures, are used to lead the people into large and unjustified expenditures of public money on ventures that are practically certain to result in losses to all concerned except the politicians and their particular friends. One of the greatest dangers of municipal ownership is its use to further plans and purposes wholly unrelated to its desirability or possible success. . . .

Communities once having embarked on the venture of municipal ownership find it harder to get out of than to get into; yet the abandonment of municipal ownership of electric plants has been absolutely necessary in many places because the only other alternative was municipal bankruptcy. Plants which could be sold in their entirety have been sold; others have been shut down or scrapped and power purchased from an available private company.

There can be but one answer to this marked trend toward the abandonment of municipal ownership by so many of the cities which have it—it has failed. The causes of this failure are similar in every community.

The attitude of the municipal plant employee also confirms this conclusion. One is struck by the frequency with which employees of municipal plants ask for information regarding a job with some good company. The reason is almost invariably the same—there is no opportunity for advancement in a municipal plant. . . .

Contrary to general opinion, graft has little, if anything, to do with the failure of municipal ownership.

Many such plants have been conducted honestly and honorably, only to find their way to the junk heap in the end. Unquestionably the greatest single factor in the failure of municipal ownership is inefficiency coupled with irresponsibility. The United States Census shows that it takes nearly three times as much fuel for the average municipal plant to make a kilowatt-hour of energy as is used by the average company, and that in proportion to output the municipal plants of the country employ nearly three times as much labor as do the companies.

This over-employment of labor in municipal plants is not only a mark of inefficiency—it shows clearly the baleful influence of political patronage on the operation of government enterprise. Rarely is there as conclusive an opportunity to compare political efficiency with business efficiency as in the electric light and power industry. The municipal plants serve exactly the same kind of people as the companies, and they have exactly the same demands to meet. So, when the United States Bureau of Census, impartially gathering facts from every plant it can reach, both municipal and company, finds that the companies are three times as efficient in the major operating items of fuel and labor, the conclusion is inescapable. The policy of the politician is to hire and spend; that of the company to serve and save.

Political management and political influence, with all their attendant ills, appear to be the compelling reason for the failure of municipal ownership. In addition to the over-employment of inefficient and incompetent labor, municipal plants suffer under too frequent change of administration, with the inevitable accompaniment of inexperience, faulty accounting, extravagant investment, and insufficient rates. . . .

The shifting of expense burdens from the electric plant to the taxpayers generally is clearly indicated by the United States Census, which shows that the average tax rate of municipal-ownership cities is almost 25 per cent higher than that of non-municipal-ownership cities.

Insufficient rates and faulty accounting go hand in hand. The promoters of municipal ownership have to hold out the promise of lower rates in order to secure approval of their proposals. The claim is generally made that the proposed municipal plant can give reduced rates and at least break even. Frequently a complete schedule of reduced rates is submitted with the estimates of plant cost. Such a schedule becomes practically binding on the officials, and then, in order to make the plant appear self-supporting, subterfuges in accounting have to be resorted to, such as charging to the general funds of the city all or part of the bond interest and sinking fund payments, rental of office space, services of city officials and employees whose time is not entirely chargeable against the electric plant, etc. . . .

A favorite method of shifting costs to the taxpayer is through excessive street lighting charges. Sometimes this consists in a very high rate per lamp for street lighting, and sometimes it is done by the installation of an amount of street lighting far beyond the needs of the community. Few companies receive more than 10 per cent of their gross revenue from street lighting contracts, while in many instances municipal plants receive as high as 25 per cent of their gross income from street lighting. This is often accomplished by having the city pay bond interest and sinking fund charges in lieu of a regular payment for street lighting, whereupon the report goes out that such a city gets its street lighting "free of charge," or "no charge is made for street lighting," while in fact street lighting costs under such conditions are generally far in excess of what would be charged by a company.

178. Relative Theoretical Advantages of Private and Public Operation of Urban Utilities *

Private Operation

The theoretical advantages of private operation, upon the assumption that the laws governing the matter are designed to facilitate this policy, may be summarized as follows:

Freedom in the organization and development of the operating staff, appointments, promotions, discipline, and discharges uninfluenced by special demands for political favors, with an incentive to economy and efficiency in the prospect of increased profits to be secured thereby; or, in other words, the development of a personnel and the handling of the problems arising out of it on "purely business principles." This includes freedom to pay salaries adequate to attract men of great ability to the high administrative positions.

Beyond a doubt, under certain conditions, this freedom is of immense advantage as compared with the restrictions, limitations and temptations that beset public operation under a bad system. But this theoretical advantage of private operation is, in some measure, dependent upon the conditions of competition, which has a tendency to weed out the family drones that infect any business protected by monopoly and equipped with "soft berths" for the offspring and relations of the managers, directors and chief stockholders. In other words, the conditions of monopoly that ordinarily prevail in public utility operation tend to dull the edge of the motive for efficiency in the personnel which, theoretically, seems to count so heavily in favor of private operation.

Another factor that tends to blemish the picture is the fact that a privately operated utility is dependent upon the city for franchises and privileges and may be subject to interference by regulatory bodies which are political in their nature to the same extent that a government operating agency would be; and therefore, if politics is corrupt or inefficient or impecunious, the dependent utility may be put under pressure to grant favors affecting the personnel. Jobs with salaries attached to them are the politician's capital, and it makes little difference whether the salaries are paid directly from the public treasury, or from the treasury of the public utilities, public contractors, or others, who for one reason or another desire to keep in favor with the possessors of political power. . . .

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* From an unfinished manuscript of Delos F. Wilcox, as it appeared in *The American City*, XXXVIII, No. 5 (May, 1928), 79-81.

Editor's Note: The question of *Municipal Ownership* v. *Private Ownership* is one of the most difficult ones to handle in the public utility field. Proponents of either doctrine tend to present the most naïve arguments and rationalize according to their creed without regard for either theory or fact when this particular question is involved. Dr. Wilcox, during his life, definitely took the stand in favor of municipal ownership, but aside from the emphasis, which depends on his individual analyses, he presents a well worked out consideration of the problem. In light of his declared bias it may be that he has underemphasized the advantages and overemphasized the disadvantages of private ownership with the opposite stress on the municipal ownership side. He also appears to have neglected the point that regulation may be perfected as well as government and, thus, serve to harness individual initiative and private enterprise directing it towards serving the desired social purpose.

Furthermore, in dealing with the employees, private operators often have their theoretical freedom of action restricted by the influence of organized labor. They cannot discipline or dismiss men with complete freedom, reduce wages, lengthen hours of labor or economize at the expense of the conditions of labor, without getting into a conflict which may result in strikes, disorganization of the business and great losses. Here, again, the claimed theoretical freedom of private operation in the handling of the personnel is more theoretical than real.

Freedom to buy materials at most favorable times and in the best markets, and to make contracts under the most advantageous conditions, without being tied down to acceptance of the lowest bids, received for a public letting.

Unfortunately, under private operation perhaps even more than under public operation, favoritism in purchases and in the letting of contracts may be induced by the pressure of interested parties whose chance for surreptitious profits through these channels outweighs their share of the losses to the utility caused thereby. Then, too, in some cases the freedom of action in these matters is limited by the exercise of public control through regulatory commissions or otherwise, designed to protect the interests of both stockholders and consumers. Here, as in other fields, the abuse of corporate freedom in the operation of utilities may result in restrictions that take away its possible advantages in an effort to prevent its misuses.

Freedom to adjust rates and conditions of service, to appease the complaints of those whose complaints are dangerous, to stimulate the utility business and to increase its profits.

This supposed freedom, too, is postulated largely upon the conditions of competitive business that seldom exist in the utility field. These utility enterprises, being affected with a public interest, are held to be subject to public regulation, and so under the minimum of legal restrictions now thought to be tolerable from the point of view of the public interest favoritism in rates and unjust discriminations are prohibited, and rates cannot be raised without the consent of the regulatory body, or at the very least, if they are raised, they are subject to suspension or change upon complaint and investigation. Thus, the utilities under private operation are deprived of much of their freedom in the adjustment of rates and conditions of service for their own advantage.

Freedom to extend the area of service from time to time following the territorial expansion of the urban community, and even reaching into the country where conditions are favorable, without being restricted by artificial boundary lines of the political subdivisions.

To some extent this freedom is restricted under practical conditions by the necessity of dealing with the different political authorities to secure franchises. In some states and with respect to some utilities, local franchises are not required, and to that extent local political boundaries are wiped out with respect to the main problems of expansion. Still, the local authorities generally retain some supervisory control of types of construction, location of fixtures, and other street requirements which operate to a certain extent as restrictions upon freedom of utility expansion even in those exceptional circumstances where local franchises are not required.

Freedom to raise money for capital purposes in the most advantageous way and at the most favorable time, without the restriction of arbitrary debt limits, and amortization requirements, and dependent only upon the needs and the financial prospects of the utility enterprise as affecting its credit.

Where this freedom exists in full measure, the advantage derived from it depends upon the practical ability of the utility to take advantage of it. If in the past it has yielded to the temptation to erect an unsound financial structure for the immediate benefit of its promoters or owners, its present freedom to acquire capital in any way it sees fit may be of no avail. It is the danger of financial exploitation, adversely affecting the public interest and arising largely out of monopoly conditions in the utility business, that has led to legislation putting definite and elaborate restrictions upon the freedom of privately owned utilities in financing their public requirements. Where private operation is coupled with public ownership under lease, with the burden of supplying capital falling exclusively upon the municipality, this discussion of the advantage of private operation in the matter of raising money for construction purposes, obviously, is inapplicable.

Freedom to realize economies and efficiencies by consolidations, and coöperation with other utilities through the agency of holding or management companies.

It is often claimed for such coöperation that it brings to the local utilities the benefits of wholesale buying, engineering, accounting and other technical advice, the help of the best trained experts in valuation and rate controversies, and stability in financing. There can be no doubt that coöperation of the kind referred to can be more readily effected and its benefits more readily secured under private operation than under public operation, at least while the laws governing public operation are in their present stage of tentativeness and incompleteness. But this freedom in securing the benefits of holding company coöperation and professional management brings with it certain liabilities. Absentee control and the unexplained financial arrangements between the local operating company and the far-off holding or management concern may arouse public suspicion and create public jealousies and illwill that find vent in investigations, rate contests and other expensive troubles. One need only cite, for example, the friction that has been created by the overlordship of the American Telephone and Telegraph Company over the telephone utilities of the country, which has given rise to a persistent demand for public investigations and litigation.

It must be said, also, with respect to all these points of advantage listed under various kinds of freedom attaching to private operation, that real freedom and facility in making adjustments to the requirements of an immediate situation are largely lost to the local utility that puts its affairs in the hands of a holding or management company, residing in a distant city, and interested in a multitude of other utilities scattered all over the country. A holding company may readily degenerate into a squeezing company, and a management concern into an exploiting one. These holding and management combinations, as a rule, have a great many other fish to fry, some of which are likely to be bigger and better than the petitioner's. The involvements of holding-company control often destroy the freedom in financing and in adjustments to public requirements that normally characterizes an independent public utility, and superimpose upon the local utilities' operations an amount of red tape that compares favorably with the red tape that is supposed to characterize governmental transactions.

PUBLIC OPERATION

On the side of public operation, the theoretical advantages may be summarized as follows:

Freedom to give the best possible service as the primary object of utility operation, without having to yield to the interest and the will of capitalist owners whose first demand is financial profit or lucrative jobs for themselves.

Clearly, this freedom of public operation is limited by the inescapable fact that the full cost of service, under any plan of operation, must be paid by somebody, but under public operation the cost may be shared between the consumers and the taxpayers if good public policy seems to demand it, and some of the direct expenses under private operation are greatly diminished or entirely avoided under public ownership and operation. These may include taxes levied on the utility property or its earnings, the difference in interest rates, street sprinkling and paving requirements, most of the salaries of general officers, most of the law expenses and part of the expenses of collecting the revenues and disbursing cash.[1]

Coöperation with other public authorities engaged in municipal affairs, to the end that the utility may be coördinated with the city plan, and with all public activities that have a relation to the same problem.

This possible coöperation in public service is a matter of the greatest importance to the city as an urban community, but public operation of the utilities will not guarantee such coöperation unless the responsibility for the policies and activities of the city government is properly organized. The opportunity for coöperation is there if the city has the good sense to take advantage of it.

Freedom from the strait-jacket of state regulation and the expenses and futilities of rate cases involving the conflicts of valuation theory and the paralyzing effects of Federal court control.

Public ownership and operation mean, once and for all, the escape from litigation under the Fourteenth Amendment, the bulwark of vested interests, and from the exasperation, uncertainties and injustices of the reproduction cost theory as distinguished from actual cost, the latter being the universal and necessary base for municipal accounting. Without being dominated by the formal and uniform policies adopted by the state commission, public operation can adjust rates to meet the particular exigencies and the social and political policies of the city. The quality and extent of the service rendered are largely matters of community concern, and with the knowledge that what they demand they will have to pay for, the consumers in a given municipality at a given time may prefer poorer service to higher rates, or vice versa, and this local preference can more readily be put into effect under public operation with local responsibility than under private operation with state control.

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[1] EDITOR'S NOTE: As pointed out in the first sentence the incidence of many of these costs is all that changes. They are absorbed by the taxpayers.

This advantage will be largely lost in those states where municipally operated utilities are subject to general regulation by the state commission in matters relating to service and rates. For example, if in a given community the people prefer to pay higher domestic rates for water and get fire protection free, or if they prefer to make the electric lighting and power rates high enough to provide a surplus for extensions, or even for the relief of taxes, there is no sufficient reason why they should not be permitted to adopt these policies, even though they run counter to the general utility policies established by the state commission. Public operation, particularly where it is localized, makes these adjustments possible.

An illustration may be found in the Massachusetts policy with respect to street-railway rates in the different cities served by the Eastern Massachusetts Street-Railway system, now under public management. Also, in New York City, although the subways are not publicly operated, the lease contracts for their operation have preserved the 5-cent fare by provisions under which interest and sinking-fund charges are paid out of taxes amounting in 1927 to nearly $13,500,000. On the other hand, in Jacksonville, Fla., it has been the policy for the city to make large profits from the municipal electric plant, which would not be permitted under state regulation.

Freedom to "democratize" the administration of public utilities by attracting men to the higher positions without paying the enormous salaries often paid by private companies, and on the other hand, to improve the conditions of work and establish reasonable hours and adequate wages, so that the employees of the municipal utilities become in fact public servants and are recognized as such.

Favoritism may be eliminated through the adoption of civil service rules regulating appointments, promotions and dismissals, and the utility may be transformed from a sordid enterprise based on the exploitation of labor to a coöperative enterprise based on a recognition of the dignity of public service. Theoretically, also, public operation should be free from strikes, because the employees have other means of inducing a proper consideration of their rights, in matters of wages, hours and conditions of employment; but under an imperfect administrative organization, public operation has not always been free from interruptions of service through strikes of the employees.

In general, public operation has for its main theoretical advantage the opportunity it offers for community self-help on a coöperative basis, free from the sordidness of public service operated as a private monopoly for profit. It can be organized into the program of community service and development, without the interference of outside forces, whether economic or political. It is consistent with the doctrine of municipal home rule in local affairs and may lend a helpful hand in the development of municipal institutions, clearly understood, civically loved and intelligently supported, calculated in the long run to justify democracy and put its enemies to shame.

179. Municipal Ownership in the Electric Light and Power Industry of Wisconsin, Massachusetts and Missouri *

In recent years, the economic and technological bases of the electric light and power industry have been undergoing violent changes. In response to innovations in the character and methods of providing electric service, municipal electric light and power establishments have altered in both character and extent. The purpose of this short study is to analyze a few aspects of these developments as they manifest themselves in the states of Wisconsin, Massachusetts and Missouri and to describe several remarkable differences and similarities noted in respect to these states.[1]

The total number of municipal electric establishments and the

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* Adapted by H. F. Havlik from three statistical studies on Municipal Ownership in the Electric Light and Power Industry in Wisconsin (H. B. Dorau); in Massachusetts (H. B. Dorau); in Missouri (Hubert F. Havlik), *Journal of Land and Public Utility Economics*, III (1927), 173-182; 298-307; IV (1928), 137-146.

[1] Complete detailed analyses are available in the original articles from which this résumé is adapted.

number added each year are set forth in Table 100. By 1891 at least one community in each of the three states had established an electric enterprise, although Missouri had one municipal electric station in 1886 and Massachusetts one in 1888. In the early years the movement grew most rapidly in Missouri. In that state 32 municipal establishments were in operation by 1900, whereas in Massachusetts during the same period the total had increased to 18 and in Wisconsin to 15. In the next decade Missouri, although increased by 30, lost the lead to Wisconsin which added 57, while the total in Massachusetts increased by only 11.

The rapid growth in Wisconsin continued until the maximum number (105) was reached in 1919. The movement in Missouri reached its crest a bit earlier in 1915 when a total of 83 publicly owned plants operated within that state. After these peaks, the totals declined rapidly until in 1926, 90 municipal establishments operated in Wisconsin and 58 in Missouri. The number of municipal plants in Massachusetts, however, continued to increase until in 1926, the last year of record, it reached a high point of 42 municipally owned establishments. In no one year in Massachusetts has the number been less than that in the previous year.

In analyzing these trends, it is interesting to note whether the municipal establishments were purchased from private owners or constructed by the municipality and to discover in each case whether the plants began operations by generating all, generating part or purchasing all of their output. Table 101 shows that in Wisconsin 93 of the 116 instances in its history of municipal ownership originated under public auspices. A smaller proportion of the cases in Missouri began as municipal (78 out of 107) while in Massachusetts only 30 of the 45 establishments there began under municipal guidance. It is notable that in all three states, those municipal establishments inaugurated under private ownership were among the earliest electric plants, for after 1911 only 7 were established, and those in Missouri.

A comparison of the three states in regard to the original character of those establishments originating under municipal auspices reveals another contrast. In Missouri and Wisconsin by far the greater part of these plants constructed under public initiative generated all their output at their inception. The same does not hold for Massachusetts in which only 11 of the 30 plants organized by municipalities began as wholly self-sufficient generating establishments. Available evidence emphasizes an-

TABLE 100

ANALYSIS OF EXTENT OF MUNICIPAL OWNERSHIP OF ELECTRIC LIGHT AND POWER ESTABLISHMENTS IN WISCONSIN, MASSACHUSETTS AND MISSOURI

YEAR	TOTAL NUMBER OF MUNICIPAL ESTABLISHMENTS IN EXISTENCE EACH YEAR			NUMBER OF MUNICIPAL ESTABLISHMENTS ORIGINATING EACH YEAR[a]			NUMBER CHANGING FROM MUNICIPAL TO PRIVATE OWNERSHIP EACH YEAR		
	Wisconsin	Massachusetts	Missouri	Wisconsin	Massachusetts	Missouri	Wisconsin	Massachusetts	Missouri
1886.......	..	..	1	..	..	1	..	..	..
87.......	..	..	1	..	..	..	..	..	..
88.......	..	1	1	..	1	..	..	..	..
89.......	..	1	1	..	..	..	..	..	..
1890.......	..	1	2	..	..	1	..	..	..
91.......	1	1	4	1	..	2	..	..	..
92.......	2	4	9	1	3	5	..	..	..
93.......	2	6	9	..	2	..	..	..	..
94.......	3	9	14	1	3	5	..	..	..
95.......	5	12	15	2	3	1	..	..	..
96.......	5	13	18	..	1	3	..	..	..
97.......	5	15	21	..	2	4	..	..	1
98.......	8	16	28	3	1	7	..	..	..
99.......	12	17	29	4	1	1	..	..	..

1900.......	15	18	32	3	1	3	..	..	..
01.......	21	18	34	6	..	2	..	..	..
02.......	27	19	37	6	1	3	..	..	..
03.......	32	20	40	5	1	3	..	..	..
04.......	45	23	47	13	3	7	..	..	..
05.......	51	23	49	6	..	3	..	..	1
06.......	54	23	49	3	..	1	..	..	1
07.......	65	27	54	11	4	5	..	..	..
08.......	67	28	55	2	1	3	..	..	2
09.......	69	28	58	2	1	3	..	1	..
1910.......	72	29	62	3	1	4	..	..	..
11.......	77	31	64	5	2	2	..	..	..
12.......	79	36	65	2	5	3	..	..	2
13.......	83	36	66	4	1	2	..	1	1
14.......	91	39	71	8	3	6	..	..	1
15.......	101	39	83	10	..	12	..	..	..
16.......	103	39	80	2	..	1	..	..	4
17.......	104	39	80	2	..	2	1	..	2
18.......	104	39	79	2	..	1	2	..	2
19.......	105	40	80	3	1	5	2	..	4
1920.......	101	41	76	2	2	..	6	1	4
21.......	98	41	77	..	..	4	3	..	3
22.......	97	41	74	..	..	1	1	..	4
23.......	97	41	72	2	..	1	2	..	3
24.......	97	41	68	1	..	1	1	..	5
25.......	94	42	62	1	1	..	4	..	6
26.......	90	42	58	..	..	1	4	..	5
27.......	..	..	56	..	..	..	..	..	2

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[a] Includes all establishments changing from private to municipal ownership as well as those originating as municipal establishments.

other aspect of the original nature of municipal establishments. Since 1915 in Wisconsin, 1919 in Missouri and 1905 in Massachusetts all plants originated by municipalities purchased their total output at the outset. These later dates in Wisconsin and Missouri reflect the later large-scale development of the electrical industry by private initiative in those states.

The foregoing facts indicate among other things that in Missouri, Wisconsin, and Massachusetts, the majority of municipally owned establishments originated as public enterprises. This lends support to the hypothesis that electric service often began under municipal supervision because no other agency was ready or willing to provide such service.

Similar analysis can be made of that group of municipal enterprises beginning operations as private stations (Table 101). Missouri and Wisconsin again reveal a more retarded development than that in Massachusetts. By far the greater part of municipal establishments originally privately owned in the two midwestern states generated all their output when acquired by municipalities, although only a small part retained their self-sufficient capacity. In Massachusetts approximately one-half the establishments which were transferred from private to public ownership generated their entire output when they came under municipal supervision. More of these, however, remain totally self-sufficient. Again, among those plants which began under municipal supervision, the shifts from self-sufficiency to partial or complete dependence on purchased energy are interesting. This movement has been the least noticeable in Missouri and most developed in Massachusetts. Of the 67 municipal plants in Missouri originating as generating all their output, only 23 remained totally self-sufficient, while 33 changed directly to private ownership, 7 ultimately purchased all their output, 3 part of their output and 1 became private after being partially self-sufficient. The greater tendency toward dependency upon purchased current in Wisconsin is reflected in the data on that state. Only 9 of the 73 municipal plants originating as wholly generating stations remained self-sufficient, while 38 finally purchased part of their output, 5 purchased all of their output and 21 became privately owned. This tendency reaches its fullest development in Massachusetts, where none of the 11 municipal establishments originating as self-sufficient generating stations, remained in that category, while 7 purchased part and 3 purchased all current distributed, and 1 went over to private owner-

Chart 85

NUMBER OF MUNICIPAL ELECTRIC LIGHT AND POWER ESTABLISHMENTS IN MISSOURI
GENERATING ALL, PART, OR NONE OF CURRENT DISTRIBUTED
BY YEARS: 1886-1927

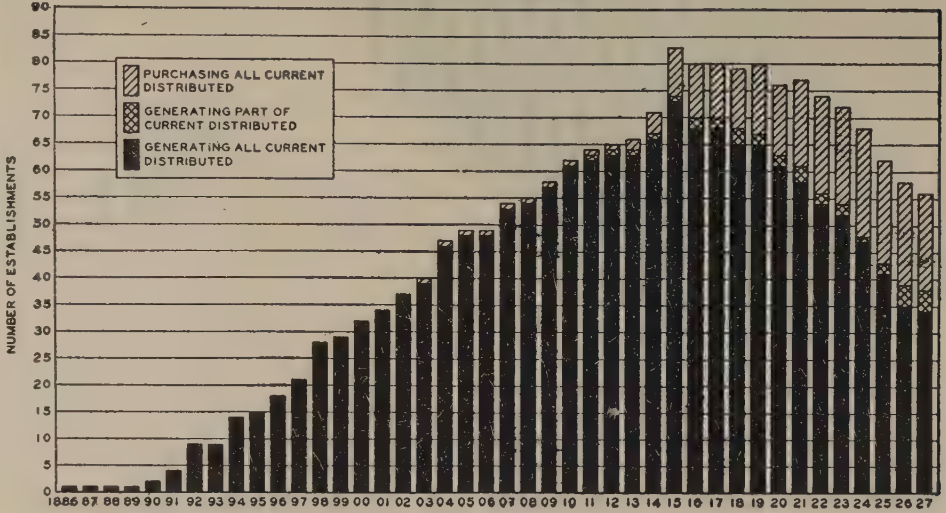
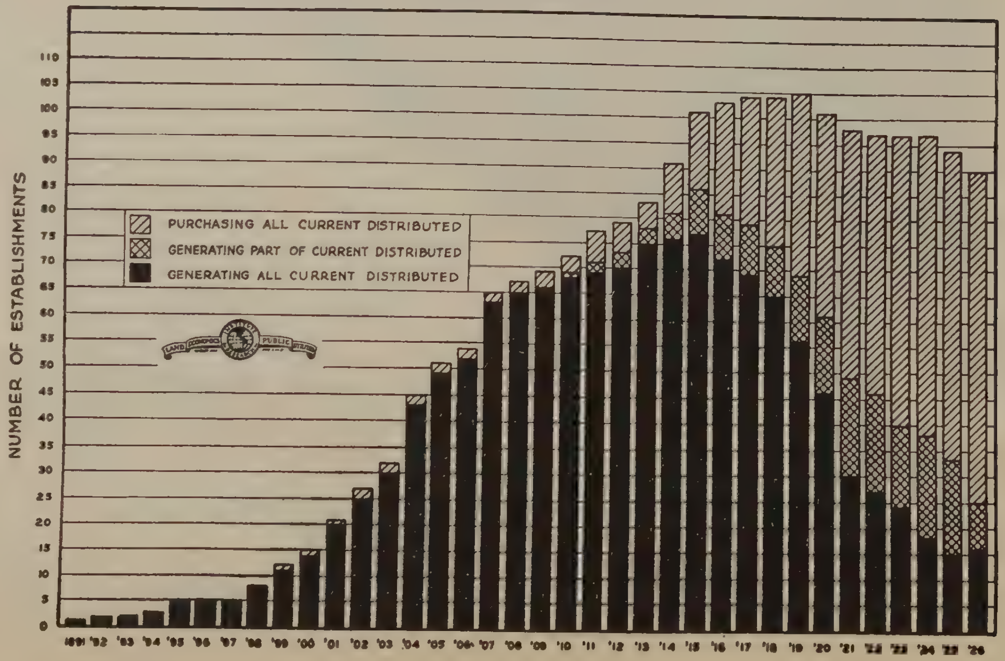


Chart 86

NUMBER OF MUNICIPAL ELECTRIC LIGHT AND POWER ESTABLISHMENTS IN WISCONSIN GENERATING ALL, PART, OR NONE OF CURRENT DISTRIBUTED

BY YEARS, 1891-1926



ship. Analysis of histories of municipal establishments acquired from private operators reveals similar results.

These tendencies are more clearly portrayed in a year by year distribution of changes in the character of electric service rendered by municipally owned plants. The net results of these developments are graphically presented in Table 101, which emphasizes the contrasts in the striking transformation of the municipally owned portion of the industry in Wisconsin, Missouri and Massachusetts.

The self-sufficient plant was dominant in all three states at one time or other. In Massachusetts the number of purely generating stations reached its maximum in 1906 and 1907; remained constant until 1914-15 when a precipitous decline set in. By 1923 no municipal establishments were any longer generating their entire output. Similar movements took place in Wisconsin and Missouri. The peaks in the municipally owned generating establishments were reached in 1915 and were followed by sharp recessions. A substantial number of municipal generating stations, however, persisted in each state.

The coöperative arrangement under which part of the output is generated and part is purchased (almost always from private plants) developed to different degrees in the states studied. In Wisconsin the first instances of this nature are recorded in 1909, since then they increased to a maximum in 1921 and 1924, when there were 20 such establishments. The growth of this arrangement in Missouri began in 1911, but at no time has it assumed any great proportions. In contrast to both Missouri and Wisconsin, the first instances of the generating-purchasing device in Massachusetts occurred in 1917 and only became important in 1923. It may further be noted that in the aggregate, 38 of the 116 establishments in Wisconsin experienced this stage of part generating and part purchasing, while in Massachusetts 14 out of 45, and in Missouri 9 out of 107, passed through this phase of evolution.

The most rapid changes in Wisconsin, Massachusetts, and Missouri occurred in connection with purely purchasing establishments. This step in the economic evolution of publicly owned enterprises started earliest and developed most in Massachusetts. In contrast, Missouri exhibited this stage much later, but never to the extent of its strength in either Massachusetts or Wisconsin. In fact, the changes in character of municipally owned establishments have not been so great in Missouri as they have been in Wisconsin and Massachusetts. Comparison of the lists of mu-

TABLE 101

ANALYSIS OF CHANGING CHARACTER OF MUNICIPAL OWNERSHIP OF ELECTRIC LIGHT AND POWER ESTABLISHMENTS IN WISCONSIN, MASSACHUSETTS AND MISSOURI

	WISCONSIN 1891–1926	MASSACHUSETTS 1888–1926	MISSOURI 1886–1927
Total Number of Establishments	116	45	107
I. Number Originating as Private Establishments	23	15	29
A. Number Changing from Private to Municipal Establishments Generating All of Output	15	8	25
1. Number continuing to generate all of output	4	0	10
2. Number changing from generating all of output to	11	8	15
a. Generating part of output	3		1
b. Generating none of output	6	4	3
c. Generating all of output	2	4	1
d. Private ownership	0	0	10
B. Number Changing from Private to Municipal Establishments Generating None of Output	7	7	3
1. Number continuing to generate none of output	0	6	1
2. Number changing to private establishments	0	1	2
C. Number Changing from Private to Municipal Establishments Generating Part of Output	1	0	1
1. Number changing to generating none of output	0	0	1

II. Number Originating as Municipal Establishments	93	30	78
A. Number Originating as Municipal Establishments Generating All of Output	73	11	67
1. Number continuing to generate all of output	8	0	23
2. Number changing from generating all of output	65	11	44
a. To generating part of output	5	7	3
b. To generating none of output	38	3	7
c. To generating all of output	1	0	0
d. To private ownership	21	1	34
B. Number Originating as Municipal Establishments Generating None of Output	20	19	11
1. Number continuing to generate none of output	14	18	6
2. Number changing from generating none to private	5	1	5
3. Number changing from generating none to generating all	1	0	0

nicipally owned undertakings in the three states shows marked differences. In 1926, 35 municipal enterprises in Missouri were self-sufficing; 4 generated part and purchased part; and 19 purchased all their output. This is in distinct contrast with Wisconsin, where in 1926 only 16 of 90 municipal plants generated all their supply, and 65 purchased their total output. The contrast with Massachusetts is even greater. In this state none of the 42 municipally owned electric stations existing in 1926 generated all their output, and 31 were totally dependent upon purchased current. The self-sufficient municipal establishment has always been more important in Missouri than in Wisconsin or Massachusetts, where municipal plants which are solely distributing agencies dominate.

Further lack of similarity among Missouri, Wisconsin, and Massachusetts appears in transfers of central stations between private and public owners. The situation with respect to changes from public to private ownership contrasts significantly with changes in the opposite direction. In Massachusetts, accretions to the total number of municipally owned establishments by purchase of private plants entirely overshadowed losses by sales to private companies. Of the recorded 45 municipal establishments in that state, 15 were purchased from private companies, whereas only 3 were sold to private owners. Similar comparison in Wisconsin discloses a different phenomenon. In this state 23 municipalities acquired privately owned plants, whereas 29 other municipalities sold their electric properties to private owners.

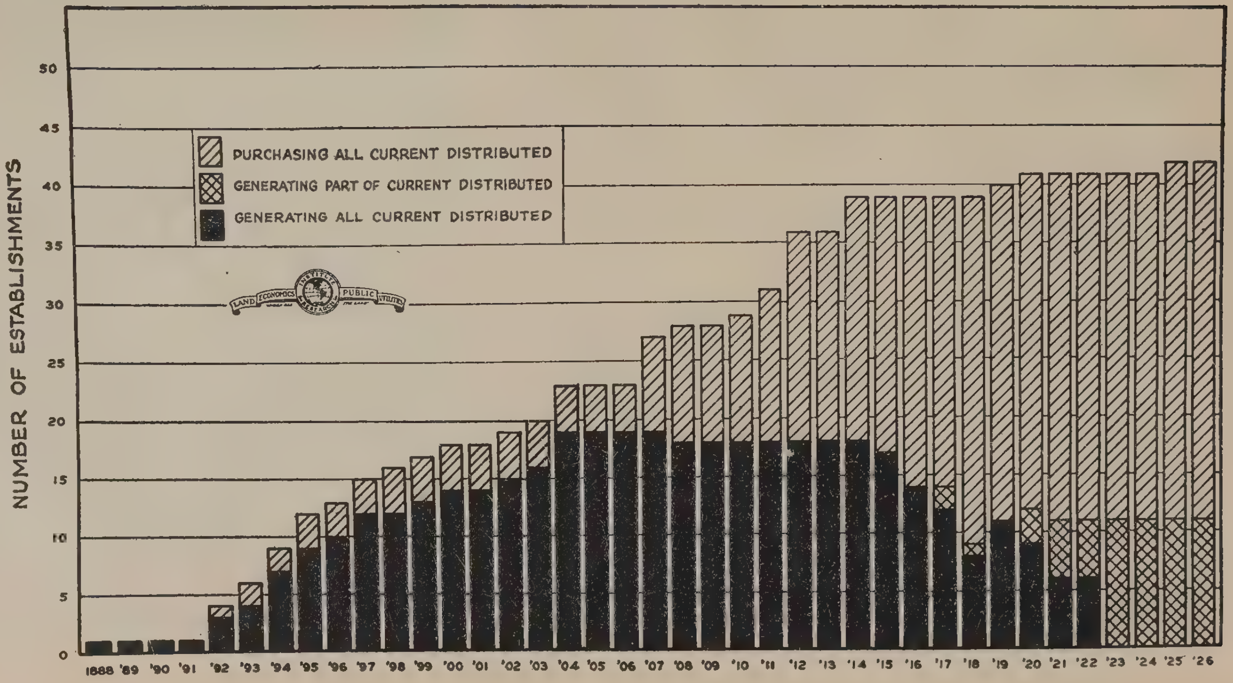
This flow of plants from one class of ownership to another has been more active in Missouri than in either of the other two states analyzed. Almost twice as many electric establishments were sold by municipalities to private companies, as were purchased by municipalities from private owners. Transfers from public to private ownership occurred 53 times (2 of the plants so transferred later returned to municipal ownership) and 31 sales of private establishments to municipalities took place. Two of these 31 private plants had previously been municipally owned.

Changes of this character, where an establishment has been operated under municipal ownership at two different periods, with a period of private ownership intervening, indicate a quicker tempo of municipal ownership in Missouri than in Wisconsin and Massachusetts. In one of the instances recorded in Missouri, an electric light and power establishment, which

Chart 87

NUMBER OF MUNICIPAL ELECTRIC LIGHT AND POWER ESTABLISHMENTS IN MASSACHUSETTS GENERATING ALL, PART, OR NONE OF CURRENT DISTRIBUTED

BY YEARS, 1888 - 1926



was inaugurated under private auspices transferred to municipal ownership, reverted to private ownership and then was a second time purchased by the municipality. In the other instance of record, the electric plant was established under municipal auspices, then sold to a private company which later resold the establishment to the municipality. No similar instances have been found in Wisconsin or Massachusetts.

In summary, these contrasts of the trends of municipal ownership in the electric light and power industries in the three states studied indicate certain common tendencies as well as material differences.

Massachusetts exhibits a strong tendency away from generating self-sufficiency toward a status where the major portion of all current distributed is purchased. Since 1922 all municipal establishments in this state have purchased all or part of their output. This disappearance of the self-sufficient municipal establishment has been accompanied by a very small number of transfers from public to private ownership.

Wisconsin likewise displays a decided trend toward dependence upon purchased current. The self-sufficient municipal plants which generate all their output, however, continue to be important there, although they are in the minority when compared with those which purchase all or part of their output. It is also a matter of some consequence to note that the average size of the community having a municipally owned plant in Massachusetts is far larger than similar communities in Wisconsin. Furthermore, in Massachusetts it appears to be true that the inertia with respect to change from public to private ownership is apparently greater in larger communities than in communities the size of those which predominate in Wisconsin and Missouri.

With reference to the changing character and extent of municipal ownership, Missouri resembles Wisconsin more closely than it resembles Massachusetts. In Missouri, electric light and power establishments generating their entire output have always been the chief source of current distributed by public agencies. Also the number of sales of publicly owned establishments to private companies has been absolutely and relatively larger. However, the tendency of the movement in recent years is of most importance in forecasting the future. While the number of municipal non-generating establishments has almost doubled in the last decade, the number of self-sufficient generating plants has been halved, and since 1915 the number of municipally owned plants has sharply decreased.

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